Dry Season 2013-2014 Outlook:

Coming off another wet summer

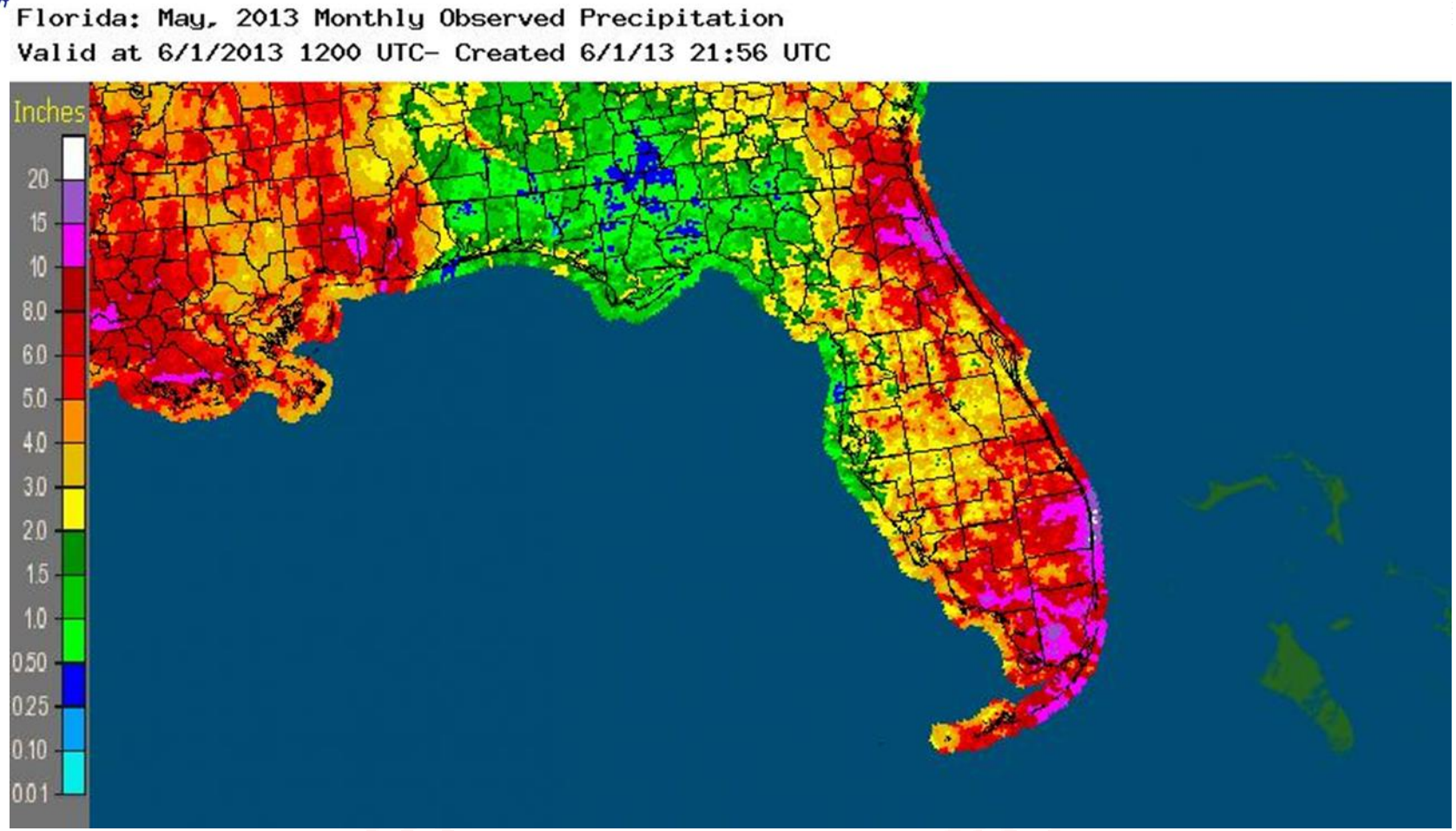
Robert Molleda

Warning Coordination Meteorologist

National Weather Service

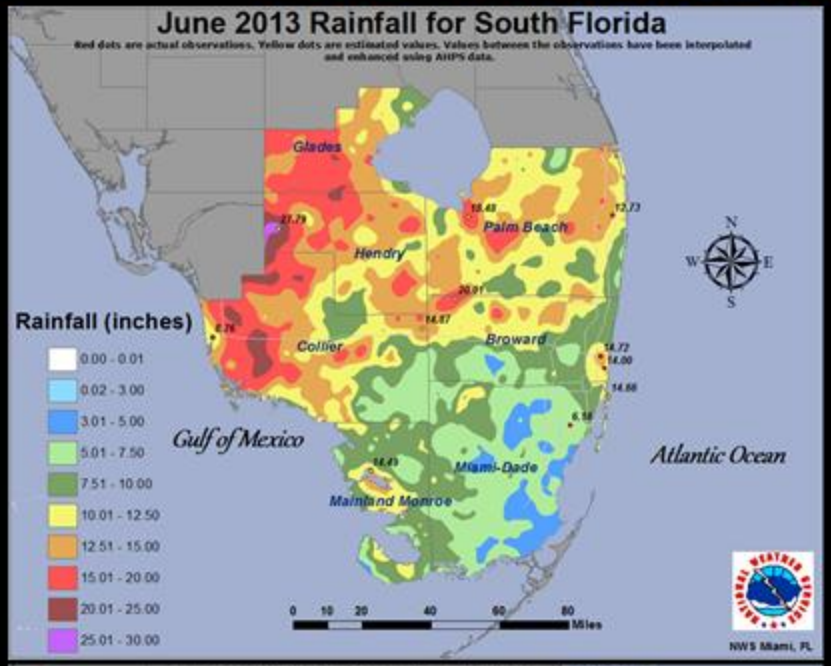
Miami Forecast Office

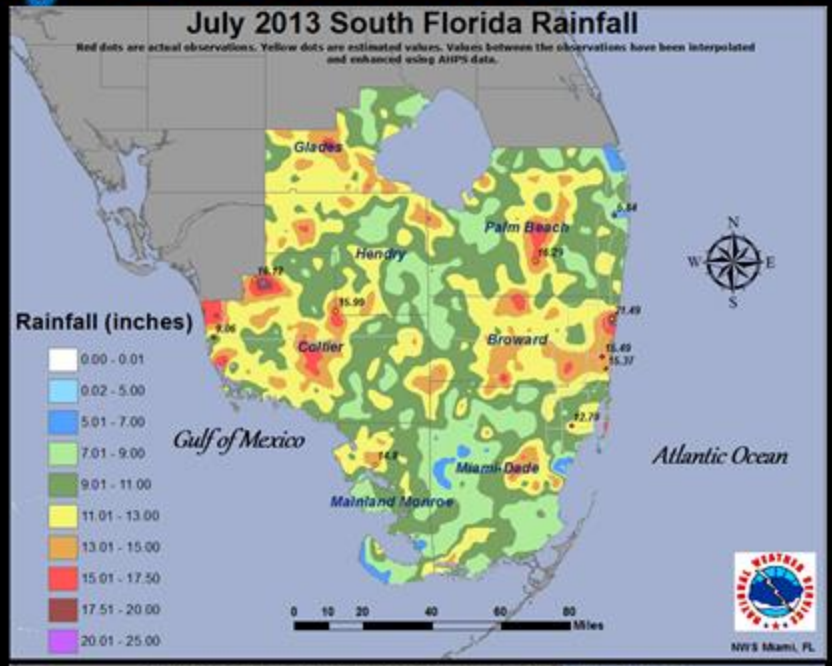
Rainy Season 2013 Summary

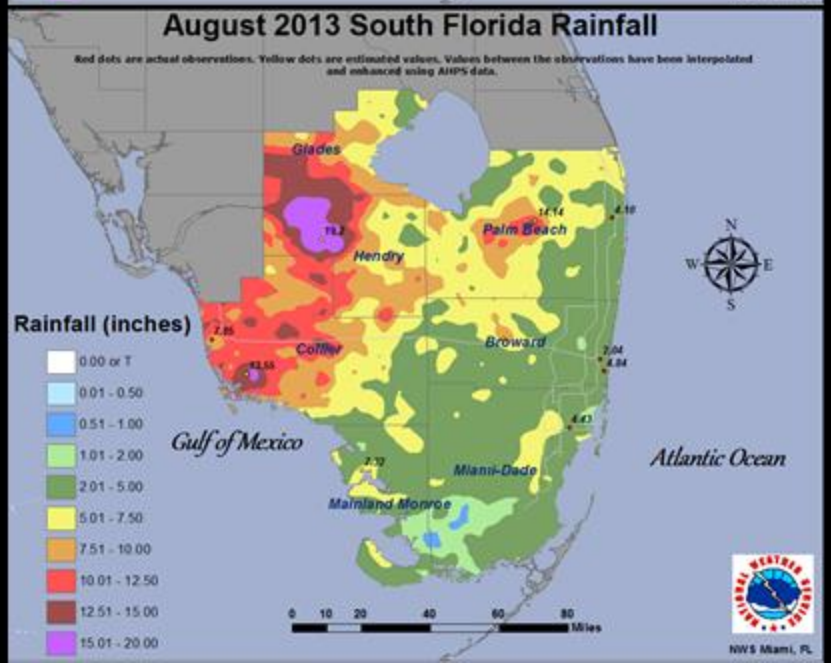


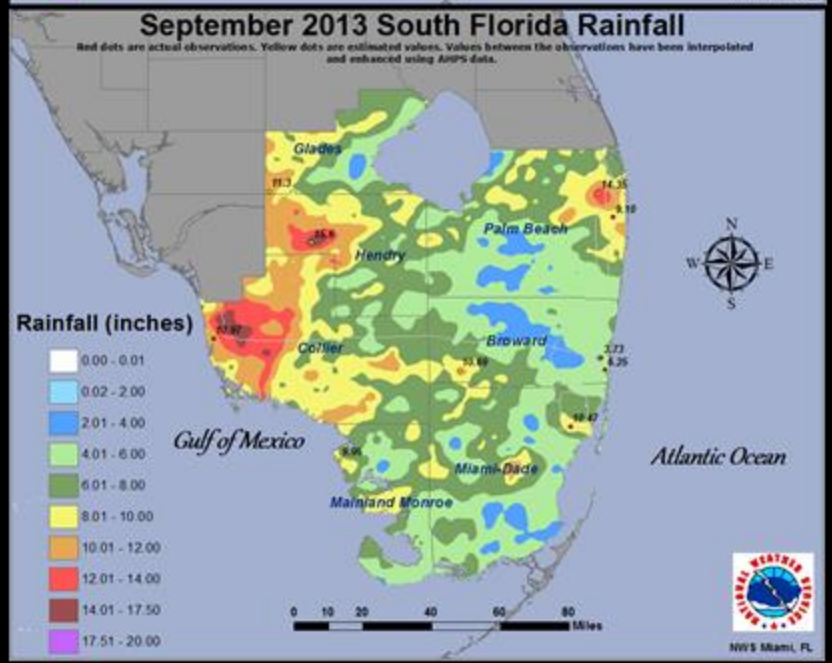
May: wet start to rainy season east coast areas.
Significant flooding in Palm Beach County > 20” for month.

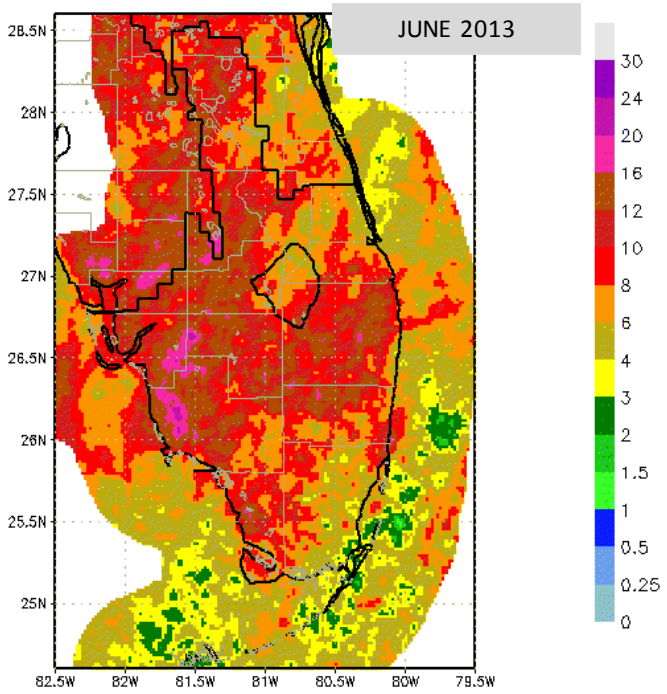
South Florida Rainy Season 2013










JUNE 2013
28.5N
28N
27.5N
27N
26.5N
26N
25.5N
25N
82.5W
82W
81.5W
81W
80.5W
80W
79.5W
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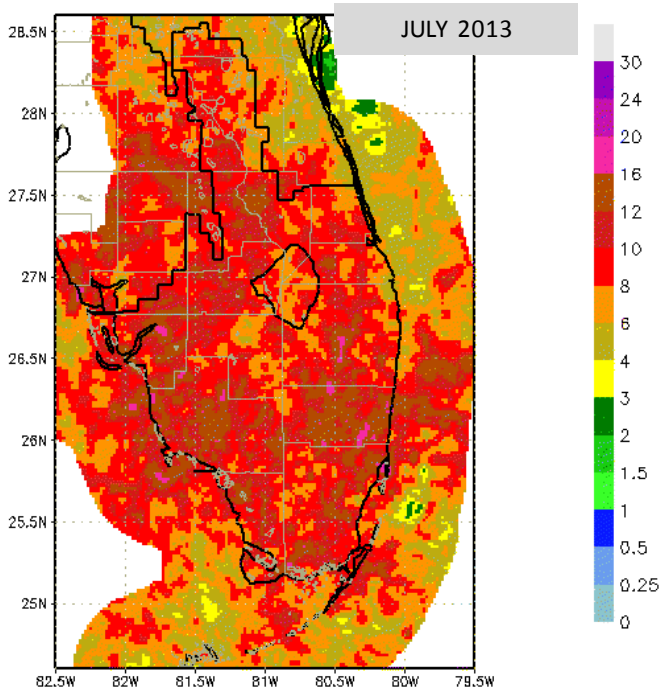
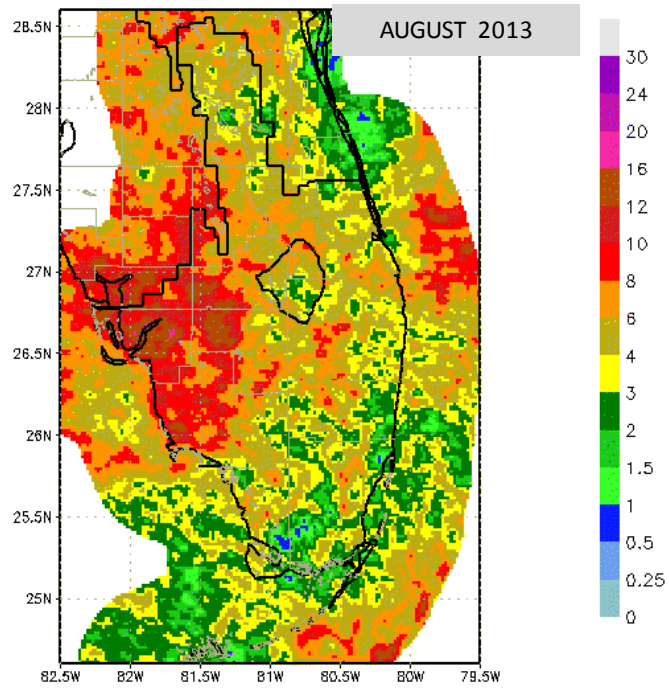
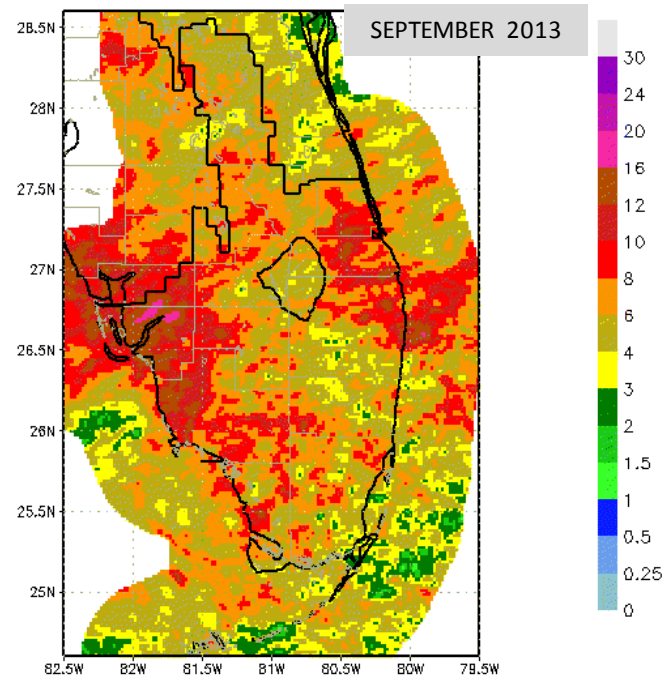
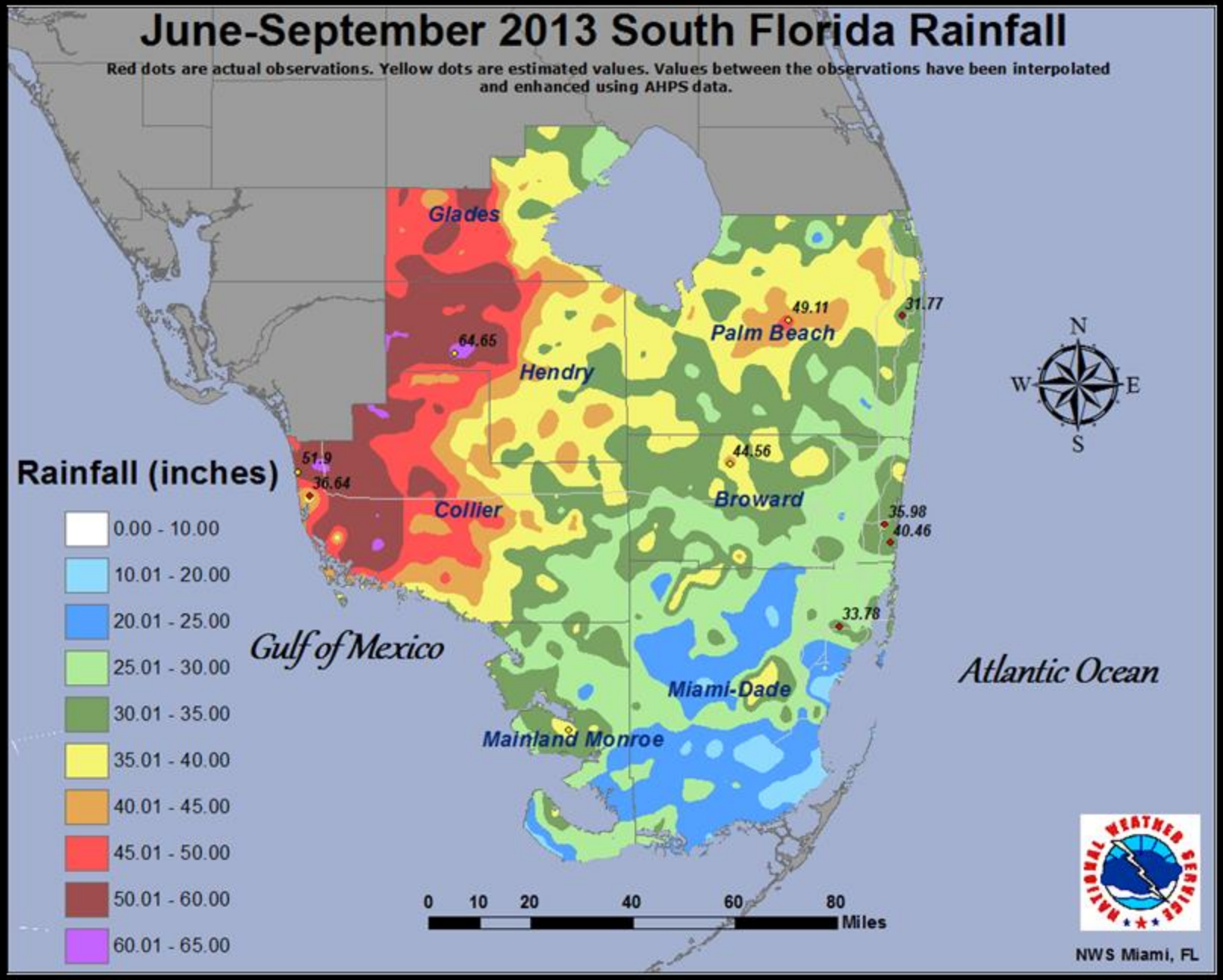
24
20
16
12
10
8
6
4
3
2
1.5
1
0.5
0.25
0


JULY 2013
28.5N
28N
27.5N
27N
26.5N
26N
25.5N
25N
82.5W
82W
81.5W
81W
80.5W
80W
79.5W
30
24
20
16
12
10
8
6
4
3
2
1.5
1
0.5
0.25
0

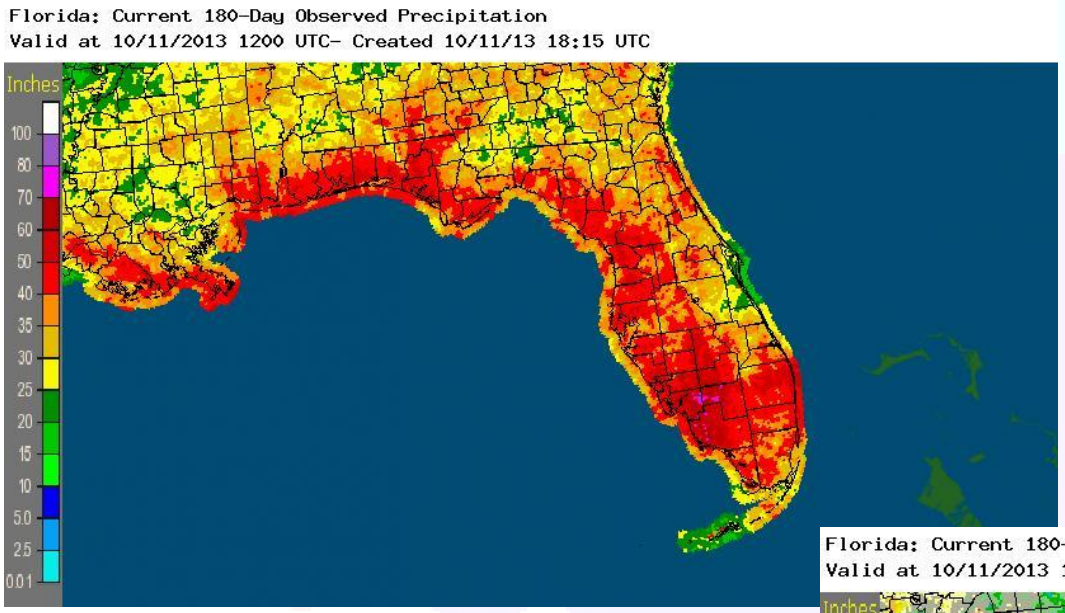

AUGUST 2013
28.5N
28N
27.5N
27N
26.5N
26N
25.5N
25N
82.5W
82W
81.5W
81W
80.5W
80W
79.5W
30
24
20
16
12
10
8
6
4
3
2
1.5
1
0.5
0.25
0

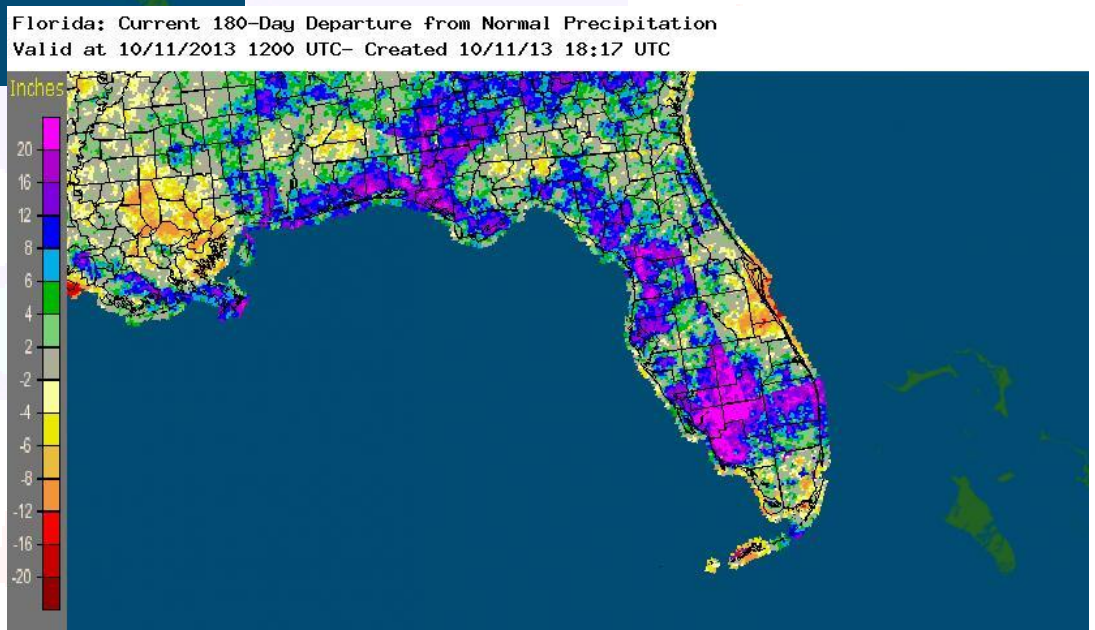

SEPTEMBER 2013
28.5N
28N
27.5N
27N
26.5N
26N
25.5N
25N
82.5W
82W
81.5W
81W
80.5W
80W
79.5W
30
24
20
16
12
10
8
6
4
3
2
1.5
1
0.5
0.25
0

South Florida Rainy Season 2013



6-month Rainfall





SW Florida & northern Palm Beach County received most rainfall.

Rainy Season 2013 Summary

- May 18 – October 10
- Normal: 153 days. **Actual: 146 days.**

Notable Wet Season Stats

- **As per SFWMD**: May through July represented the wettest start to rainy season in 45 years. April – July wettest since 1932.
- Fort Lauderdale and Miami Beach set wettest July rainfall on record.

Wet Season Rain Totals (May 18th-Oct 10)

- Juno Beach: 59.70”
- NWS Miami: 53.39”
- Naples (Golden Gate): 53.21” (5th wettest for coop site). Airport: 39.95”
- Ortona: 49.67” (3rd wettest)
- Miami: 47.90” (16th wettest)
- Fort Lauderdale: 46.17” (19th wettest)
- LaBelle: 45.14” (7th wettest)
- West Palm Beach: 43.19” (24th wettest).
- Miami Beach: 38.94” (12th wettest)
- Homestead: 35.23”
- Immokalee: 34.36”

Normal rainy season: 30-40”

Remarkably...Little Influence from Tropical Systems!

- Several localized flood events (Palm Beach in May, NE Dade/SE Broward in June, NW Collier County and SW Miami in September).

- TS Andrea in early June only tropical system to indirectly impact area with tornadoes/flooding.

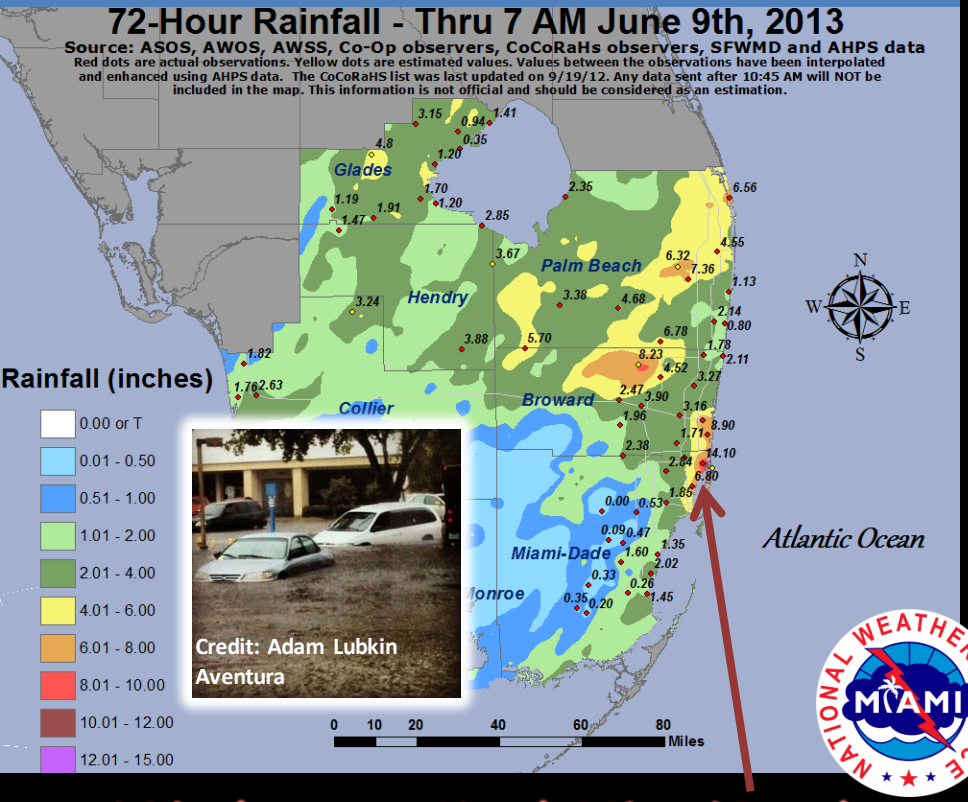
- Persistent and moist SE wind flow a key contributor to wet summer.

...Tropical Storm Andrea Impacts Across South Florida...

...A reminder that impacts extend well beyond tropical storm-warned areas...

FLOODING

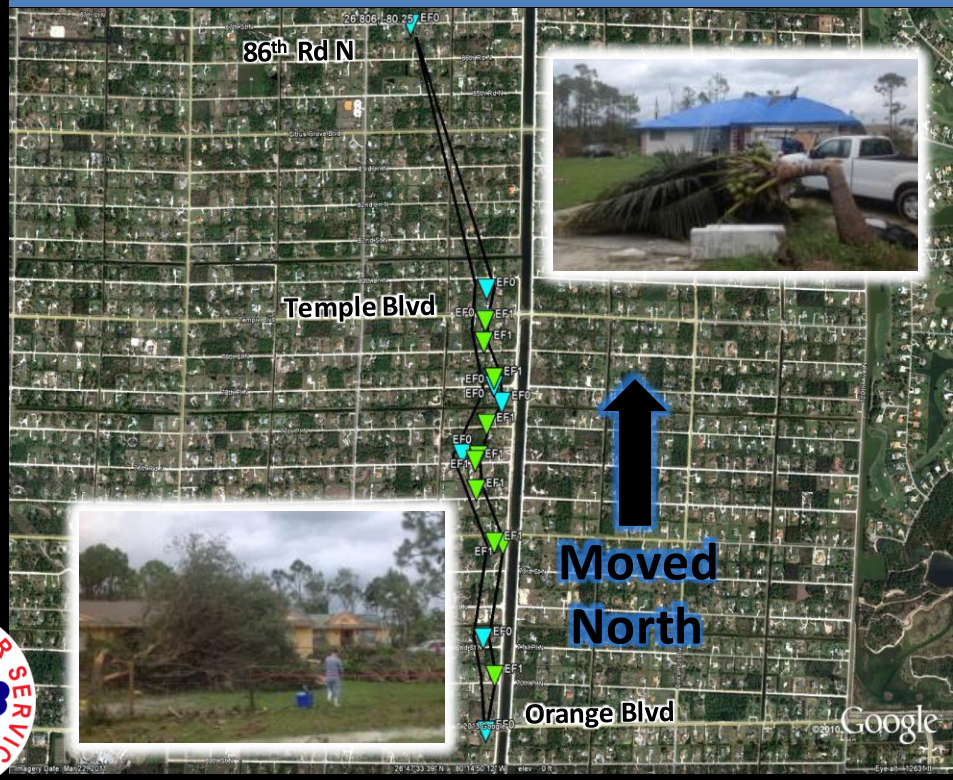
South Florida Rainfall Totals for 48-hour Period Ending at 7 AM Saturday June 8th



14 inches near North Miami Beach

TORNADOES

Path of the EF1 Tornado in The Acreage (Palm Beach County) Thursday Morning

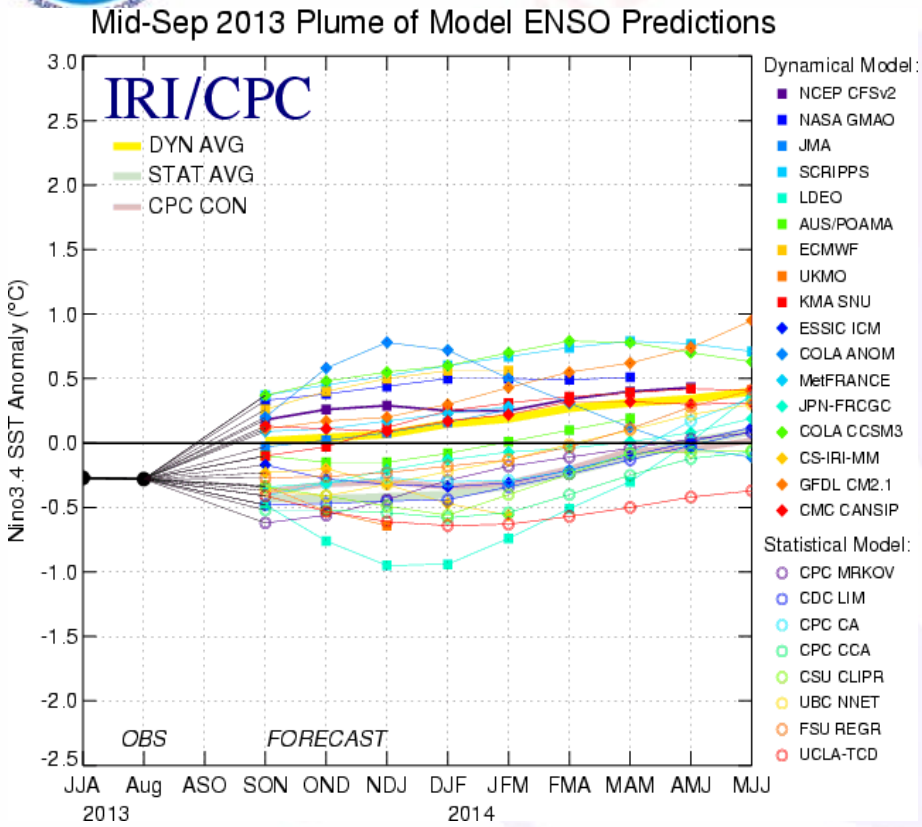


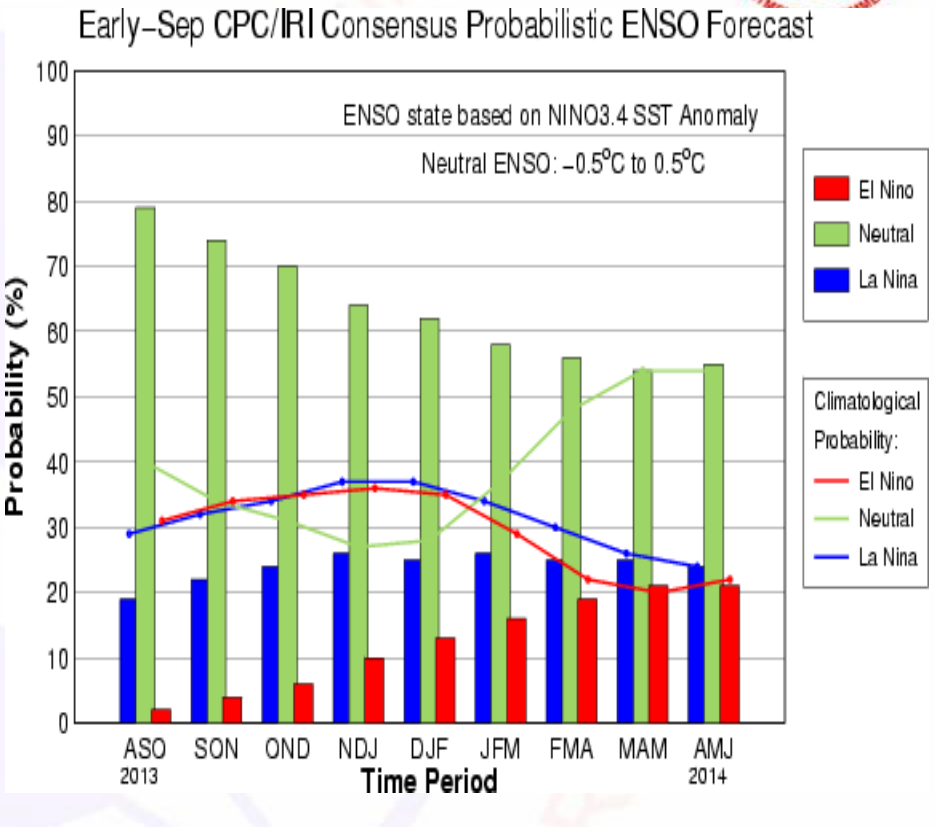
Path nearly 2 miles long/150 yards wide

NWS Miami Website: www.srh.noaa.gov/mfl
Follow us Facebook: https://www.facebook.com/US.NationalWeatherService.Miami.gov
Also on Twitter: www.twitter.com/nwsmiami

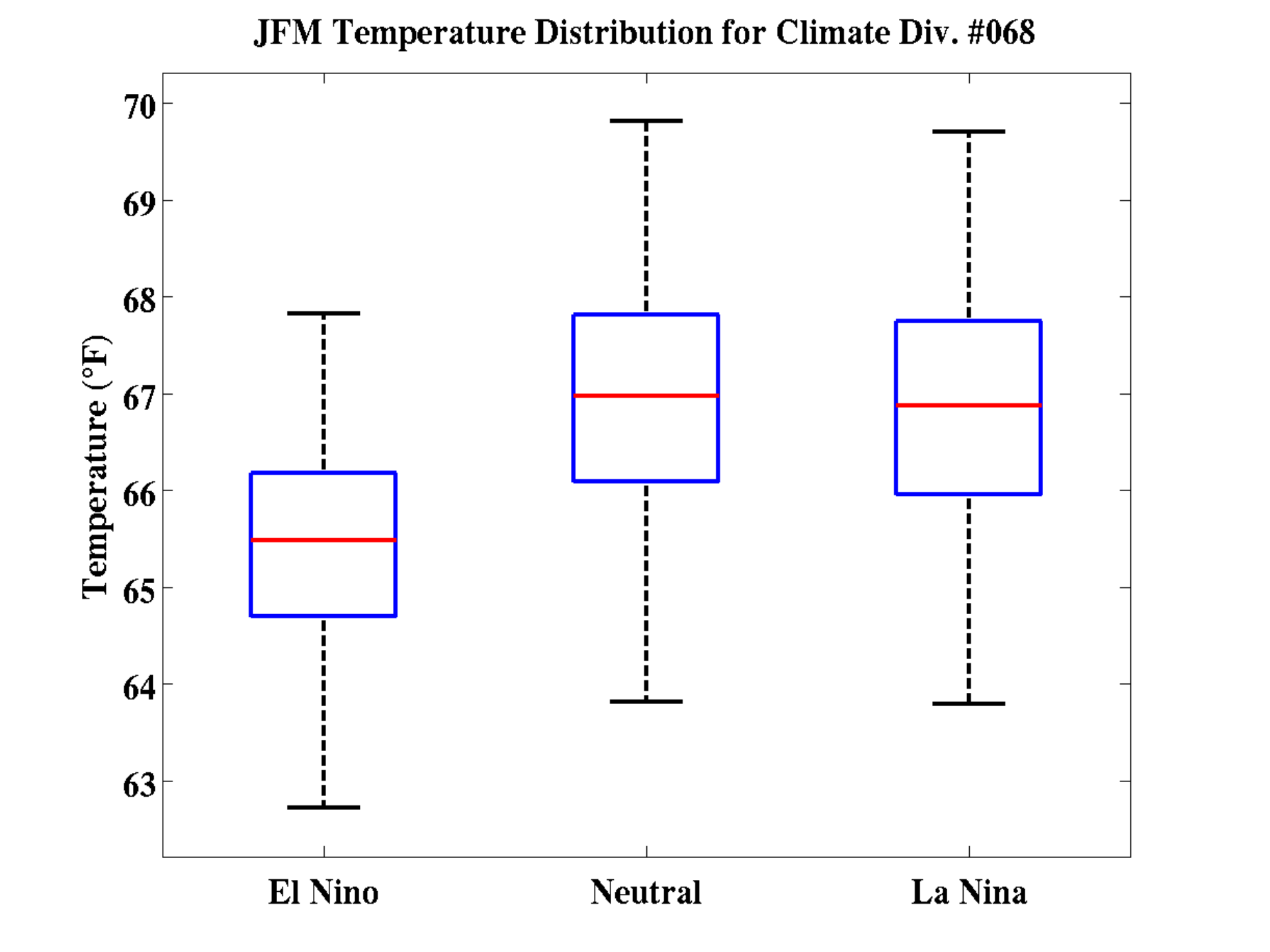
Dry Season Outlook

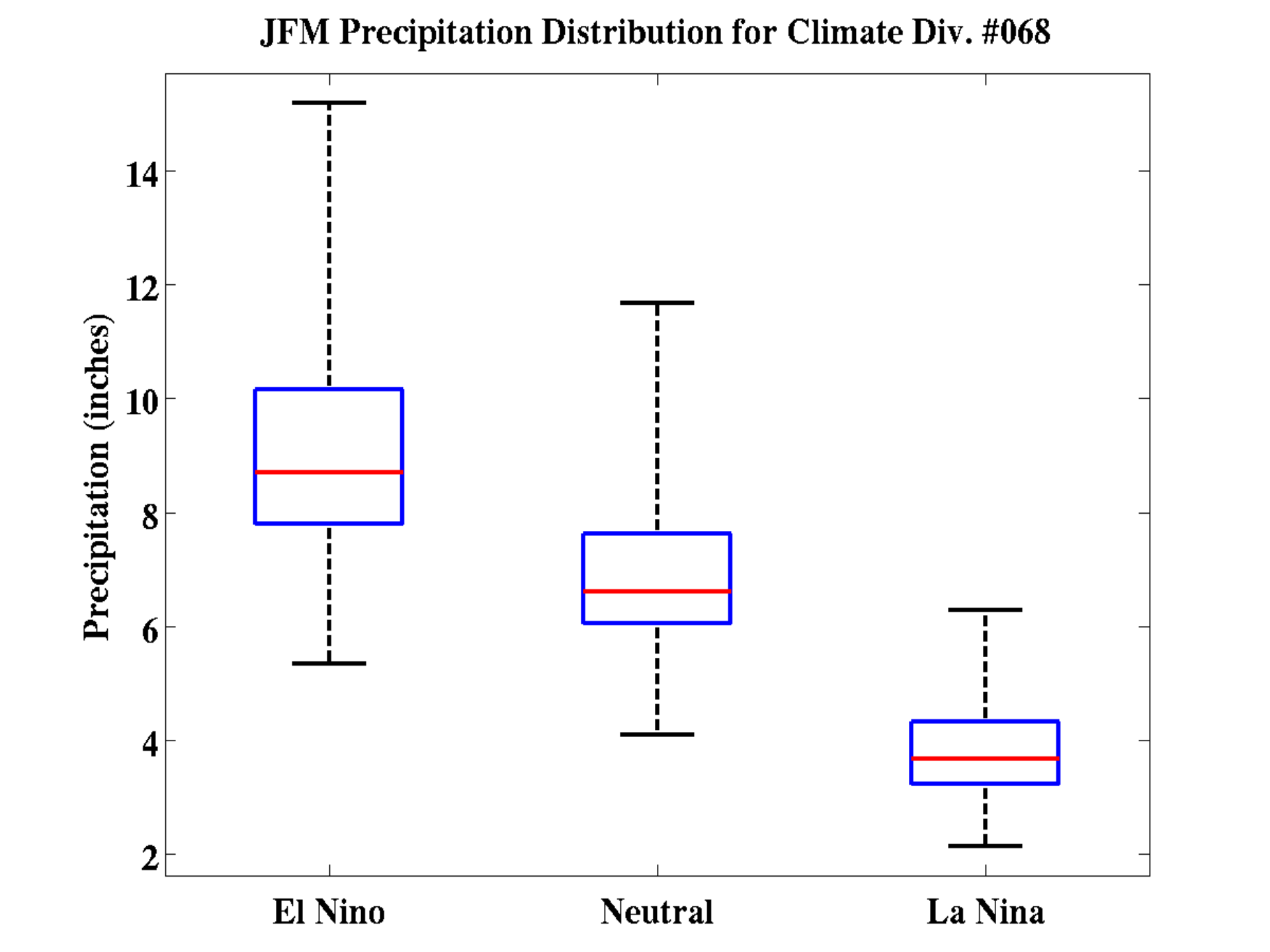
No El Niño(a)





Models favor “neutral” ENSO conditions this winter. Therefore higher level of uncertainty in dry season outlook. Positive/negative ENSO lead to better-defined dry season patterns across Florida

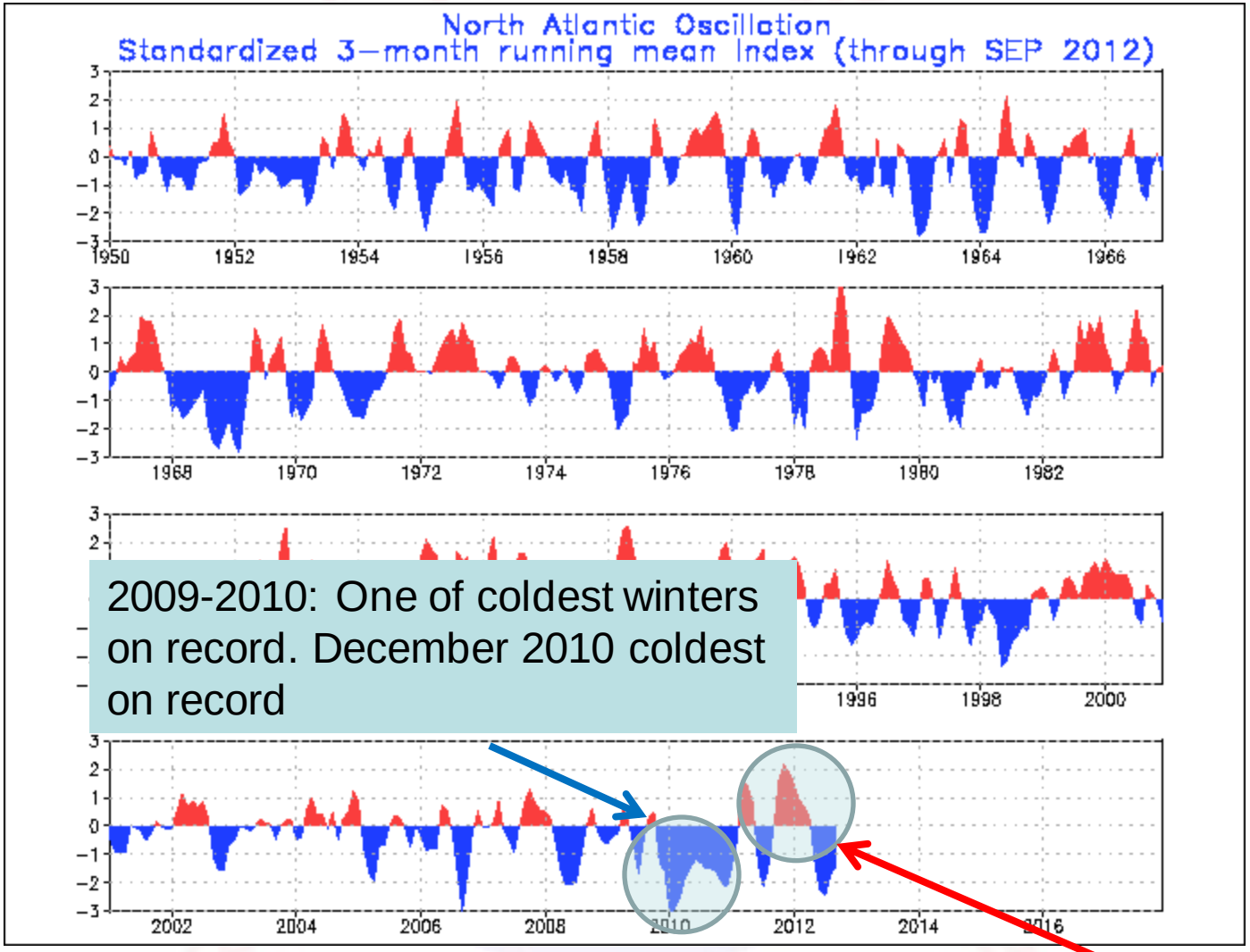

JFM Temperature Distribution for Climate Div. #068
Temperature (°F)
70
69
68
67
66
65
64
63
El Nino
Neutral
La Nina


JFM Precipitation Distribution for Climate Div. #068
Precipitation (inches)
14
12
10
8
6
4
2
El Nino
Neutral
La Nina

Other Factors

- **Intra-seasonal atmospheric cycles (NAO, PNA) can modulate ENSO phase or even dominate in neutral ENSO years.**
- **Most intra-seasonal cycles are only reliably predictable up to 14 days in advance.**
- **Conflicting/overriding signals can make long-term prediction of atmospheric conditions very difficult.**

NAO (North Atlantic Oscillation)



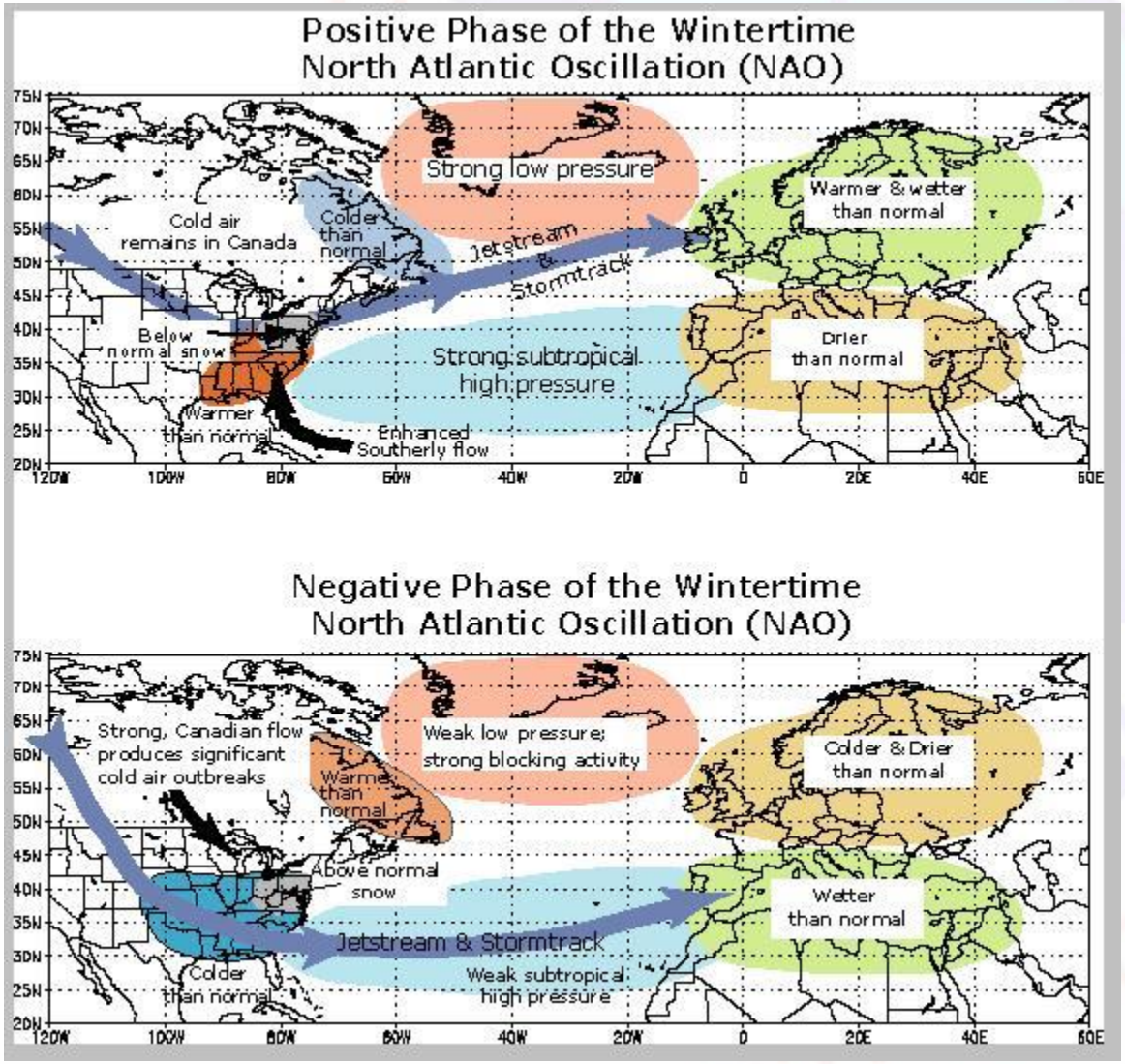
2009-2010: One of coldest winters on record. December 2010 coldest on record

2011-2012: Among top 20 warmest winters on record.

North Atlantic Oscillation

Periodic Fluctuation of Pressure Patterns over the North Atlantic Ocean – Scale of Weeks – Primary Impact on Winter Temperature

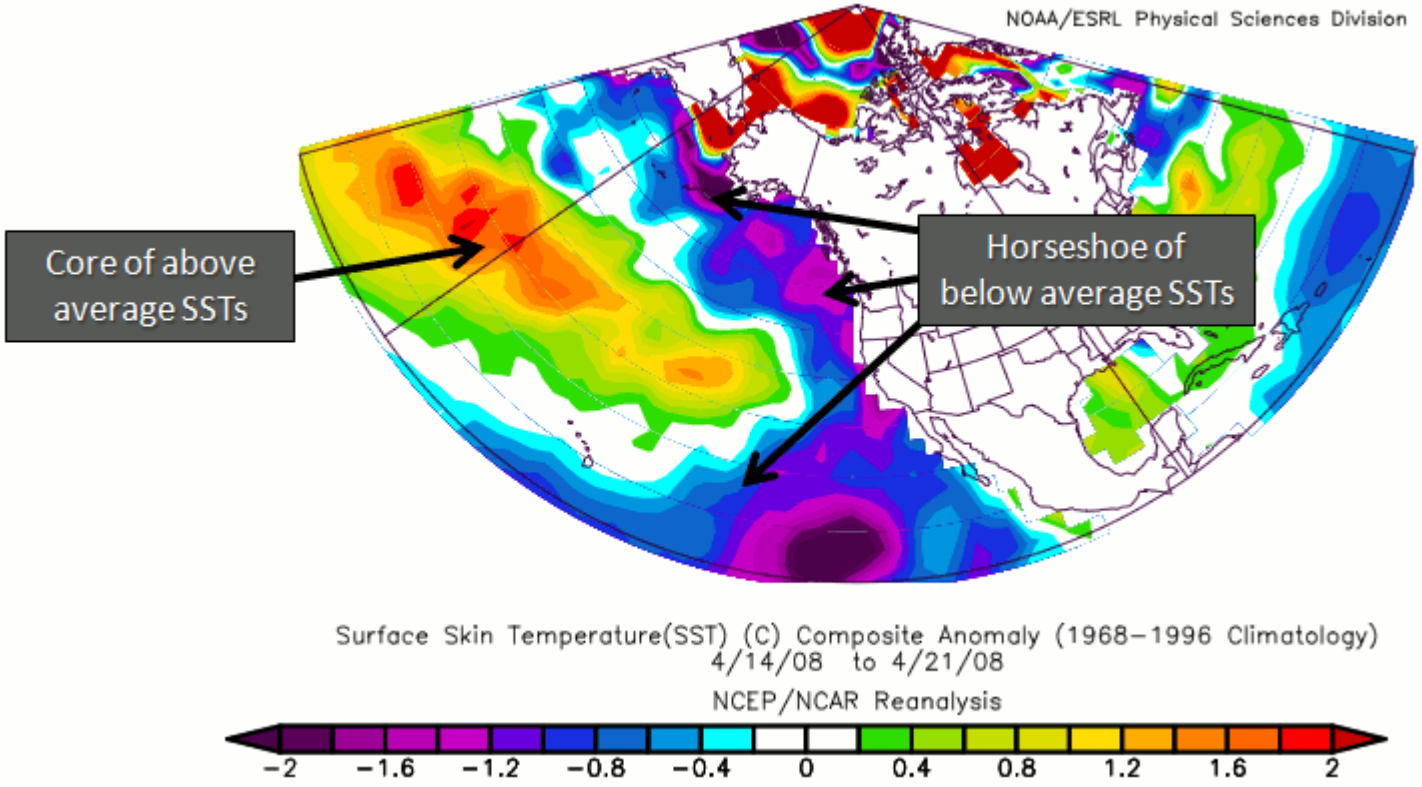
Accounts for almost a third of the variance in winter temperatures (Hurrell 1995)



2011-2012 Example

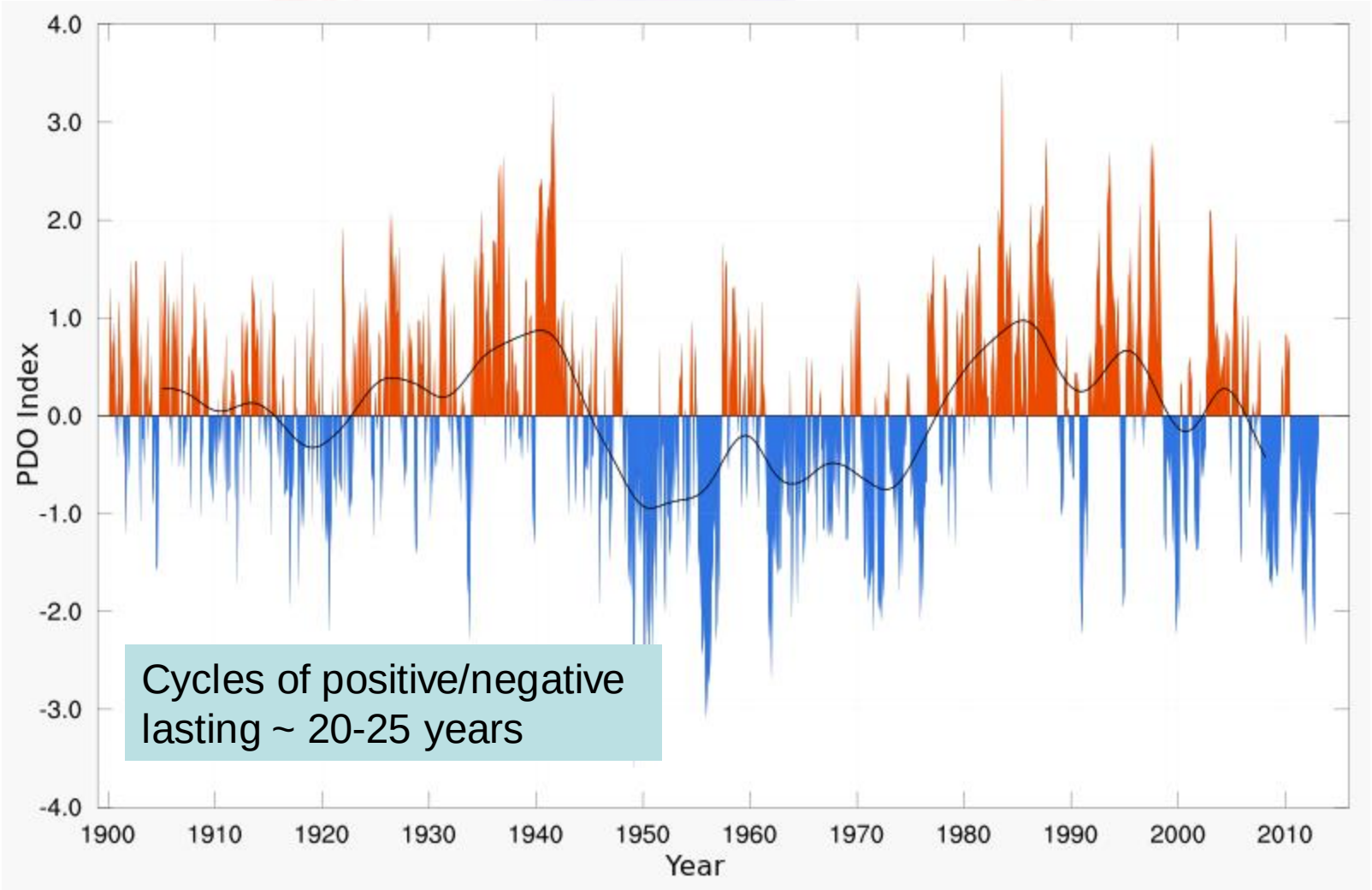
2009-2010 Example

PDO: Pacific Decadal Oscillation



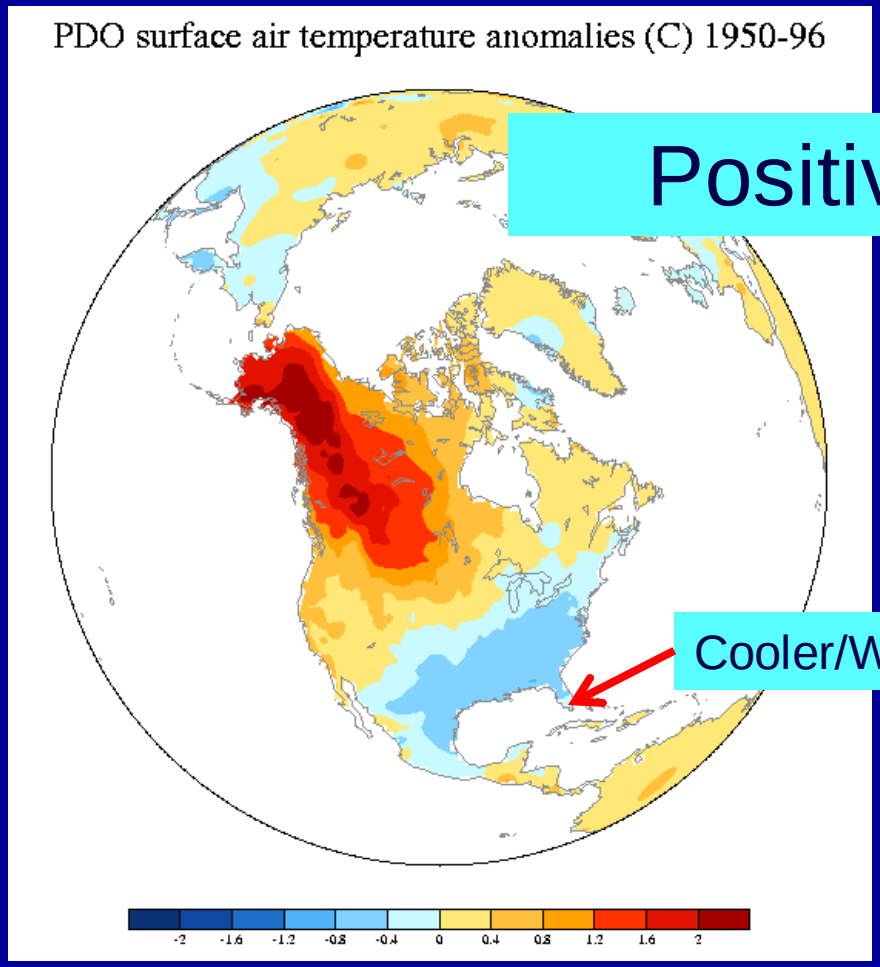
Similar to ENSO except on longer time scale and larger area (north of equator to Alaska region). Can counteract or enhance ENSO.

PDO Index Since 1900

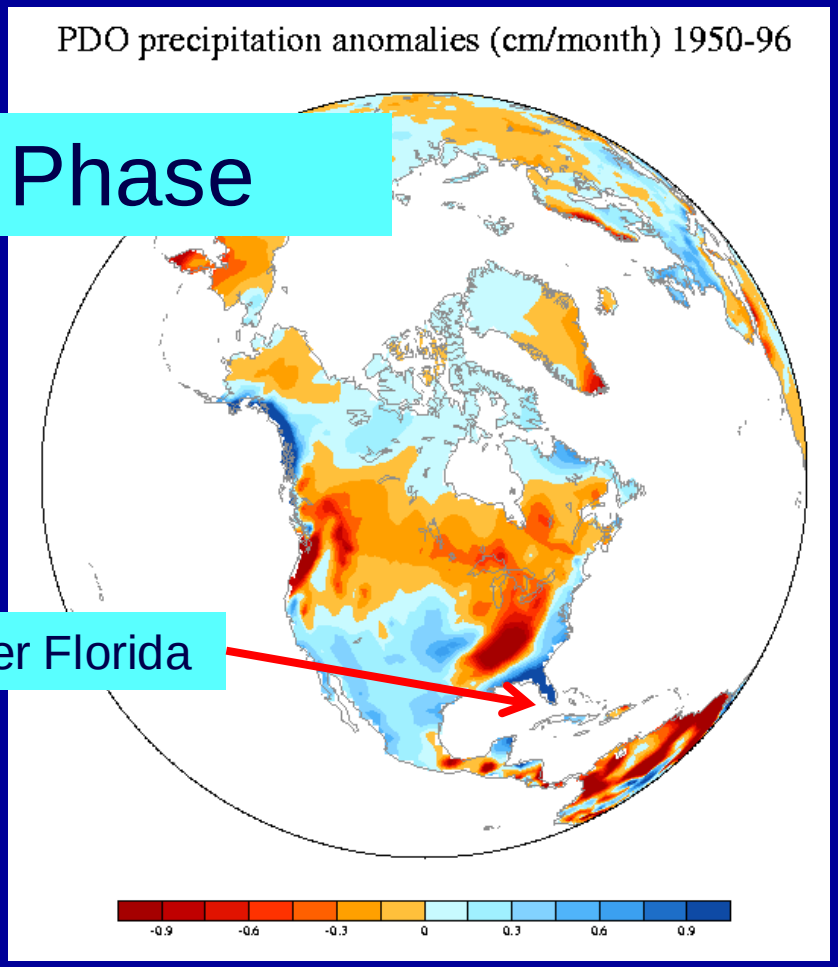


October-March PDO Regression fields

Surface Air Temperature



Precipitation

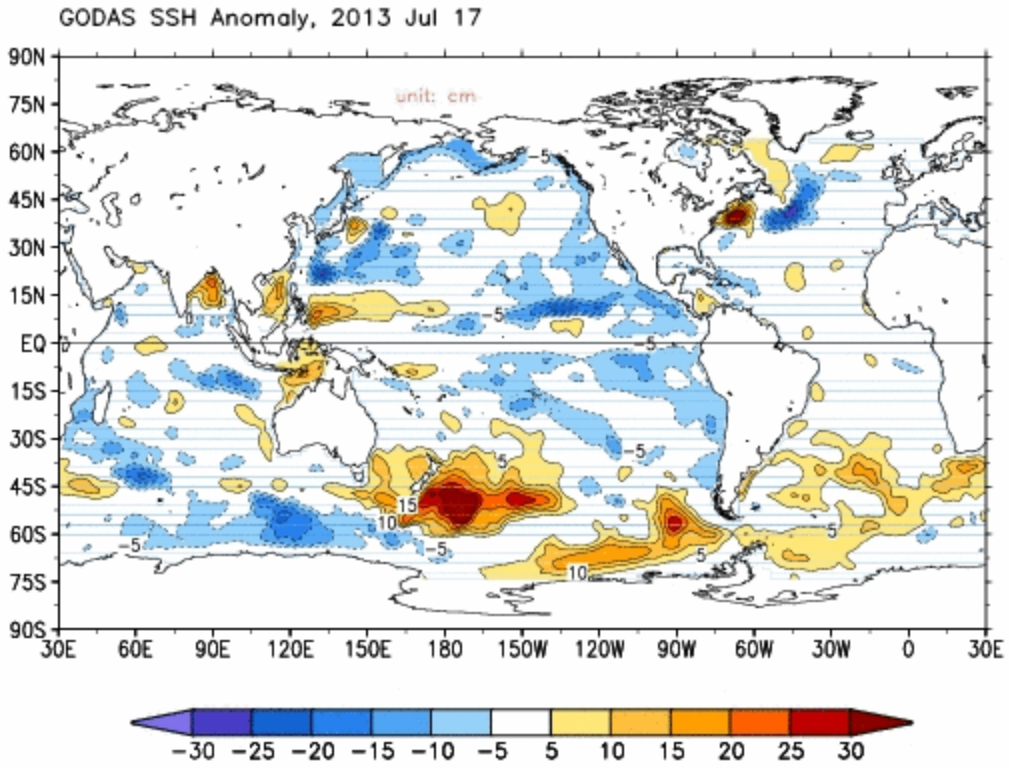


Positive Phase

Cooler/Wetter Florida

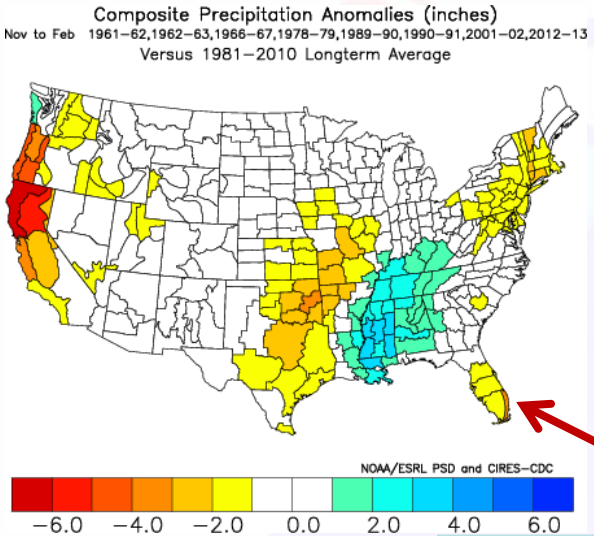
Figures produced by Todd Mitchell, UW/JISAO

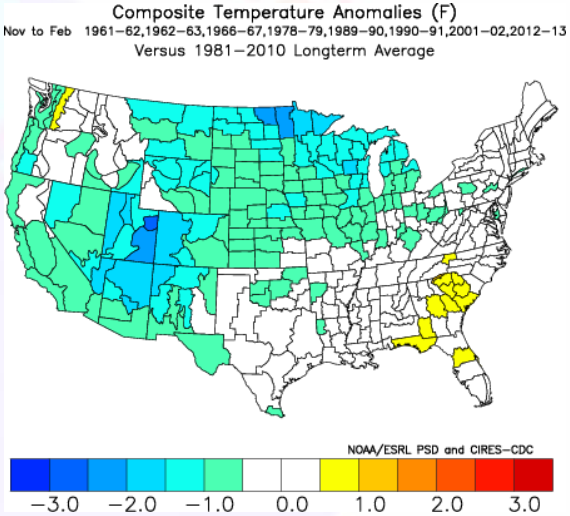
Current PDO: Negative



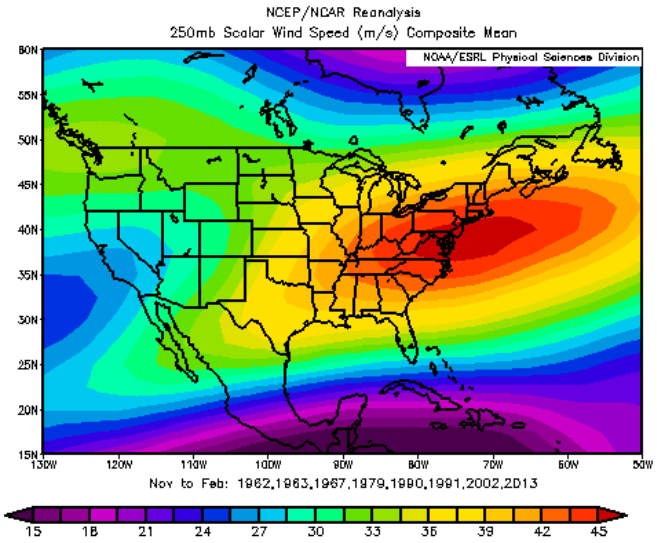
Continuation of negative phase since 2010

Negative PDO and Neutral ENSO



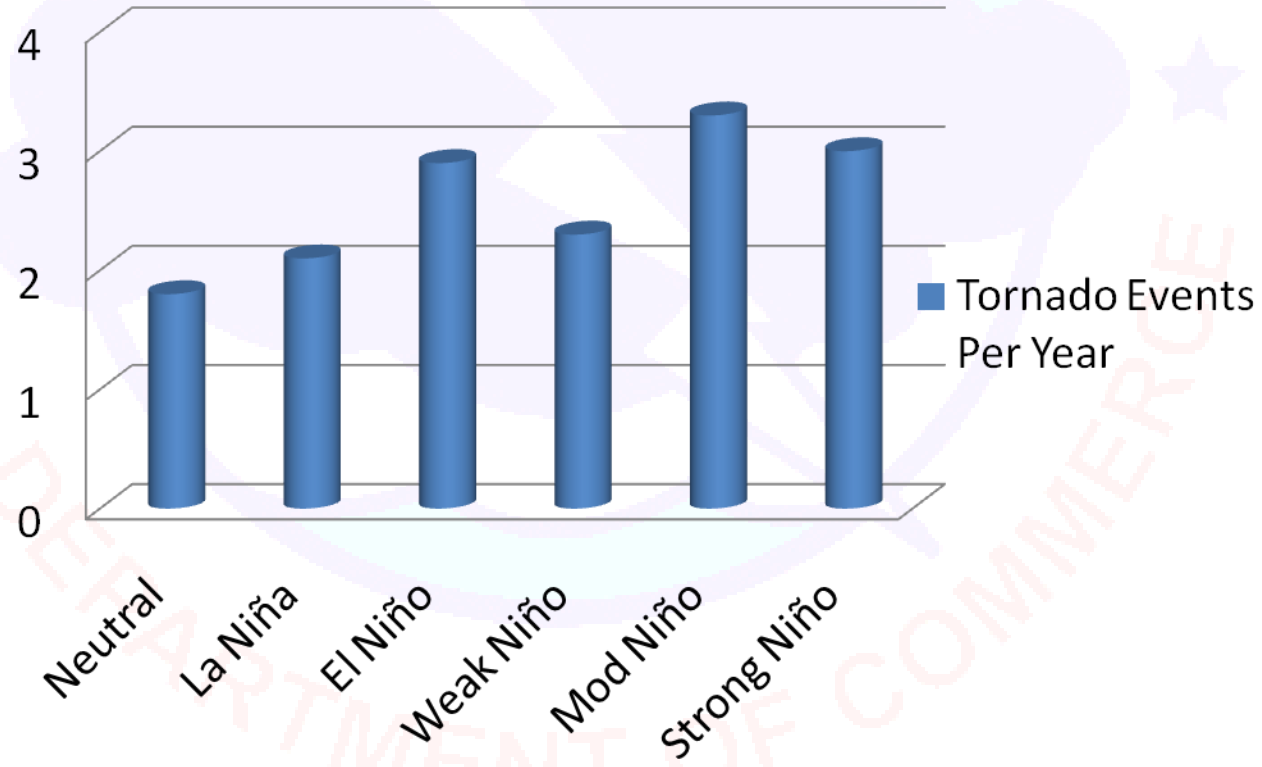


Dry Winters

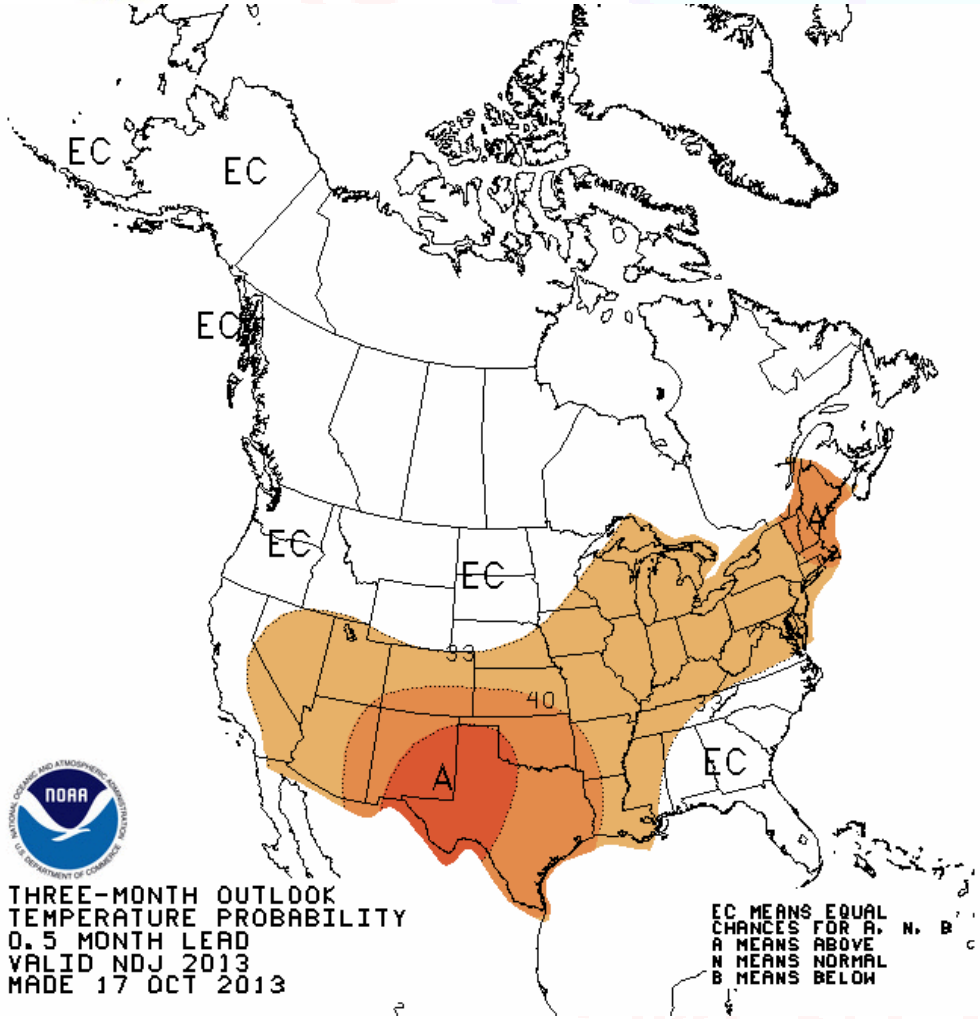


Jet stream typically remains well to north with most storms following similar track.

South Florida Tornado Events compared to ENSO phase

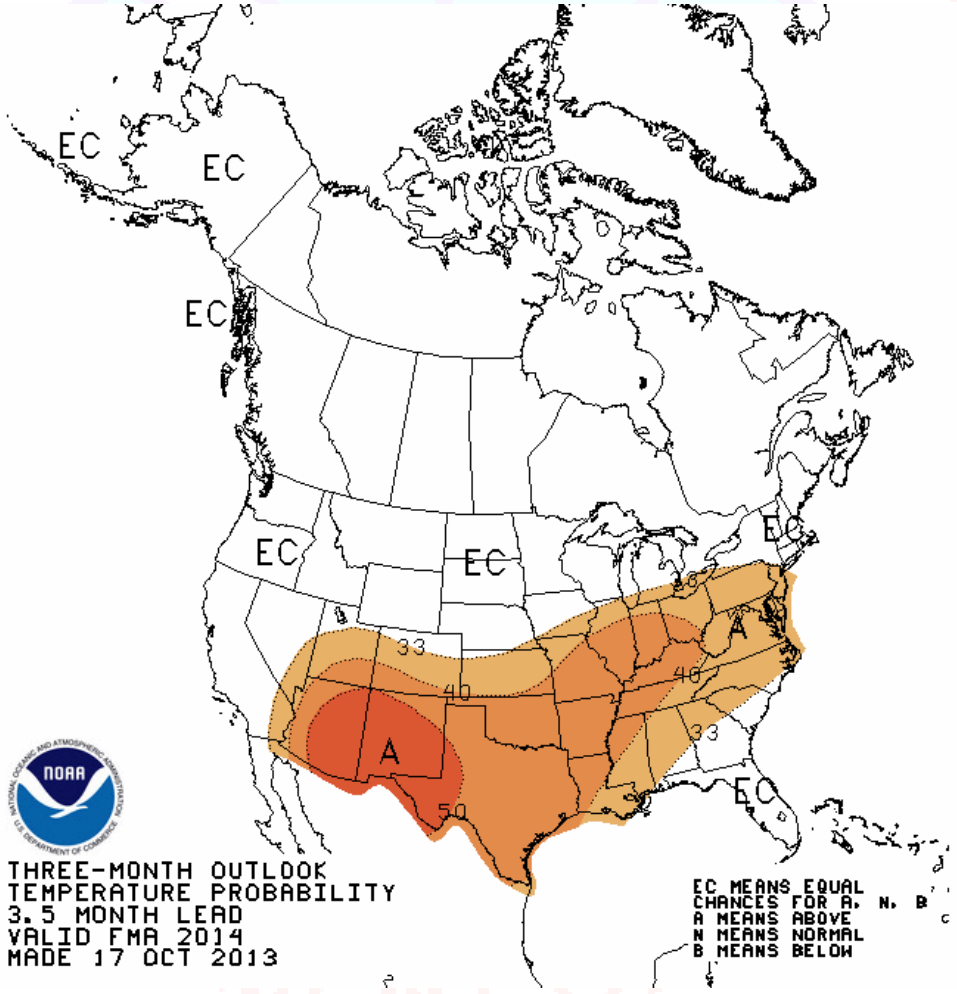


NOAA/CPC Temperature Outlook
November-January

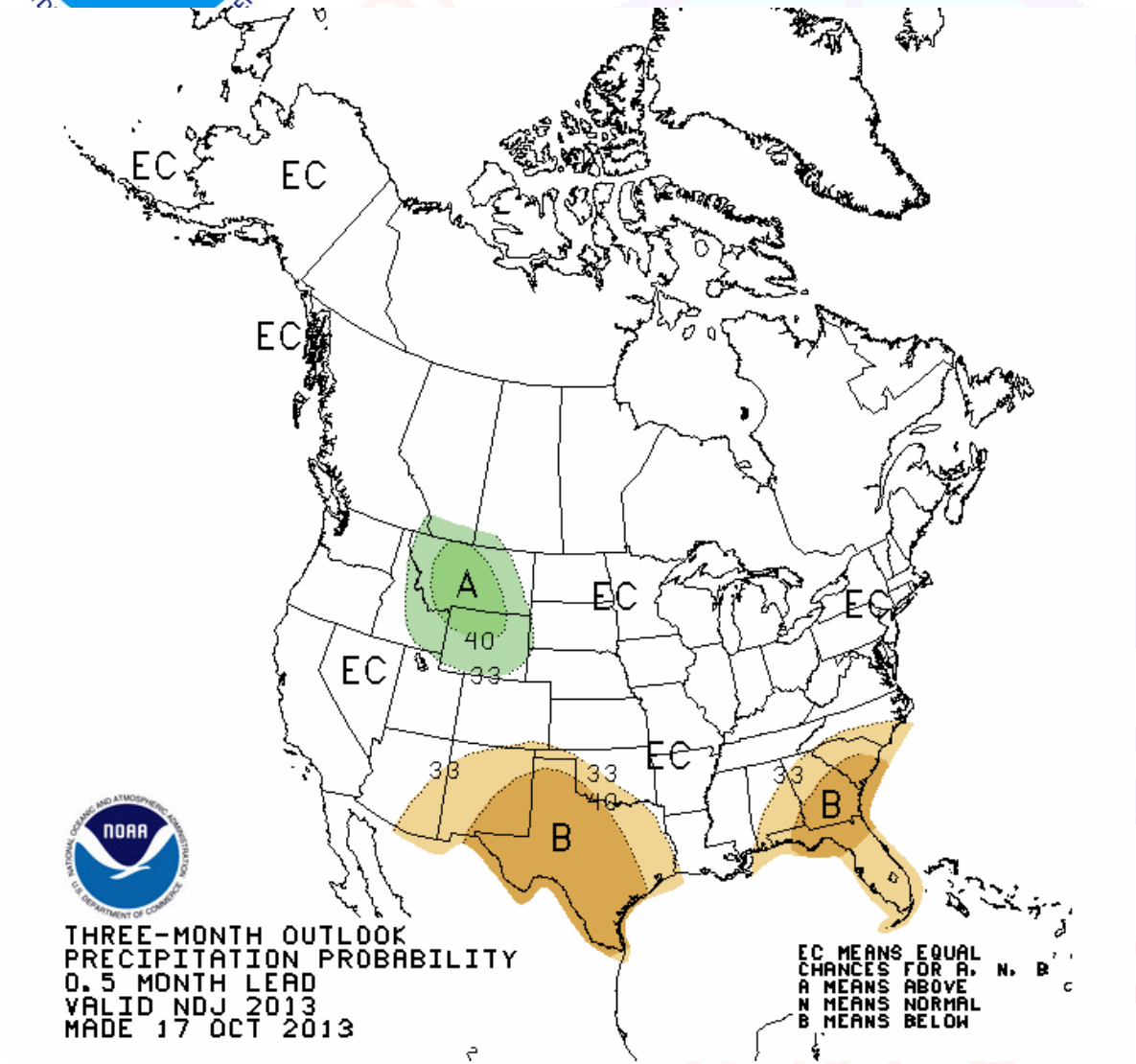


Equal chances of near/above/below normal, reflection of low Confidence.

NOAA/CPC Temperature Outlook
February - April

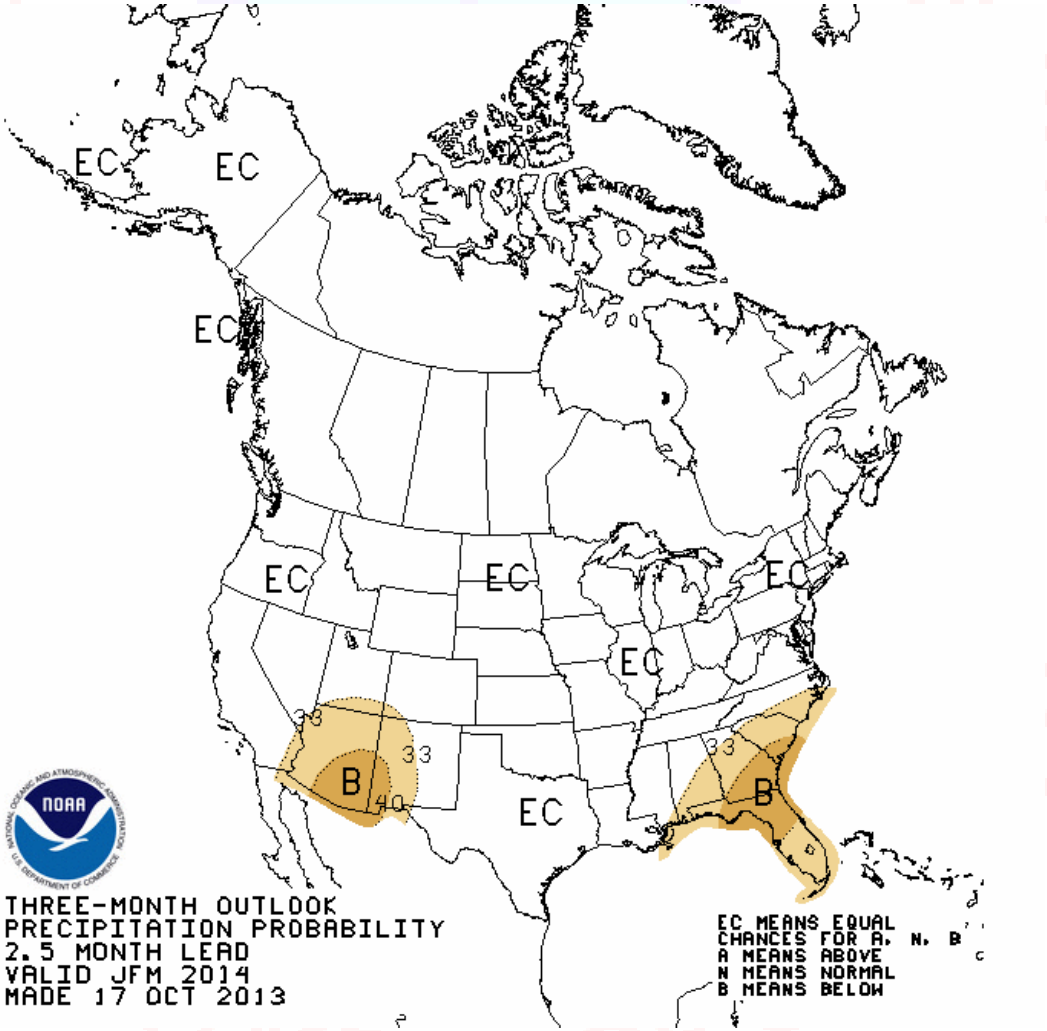


NOAA/CPC Precipitation Outlook
November - January

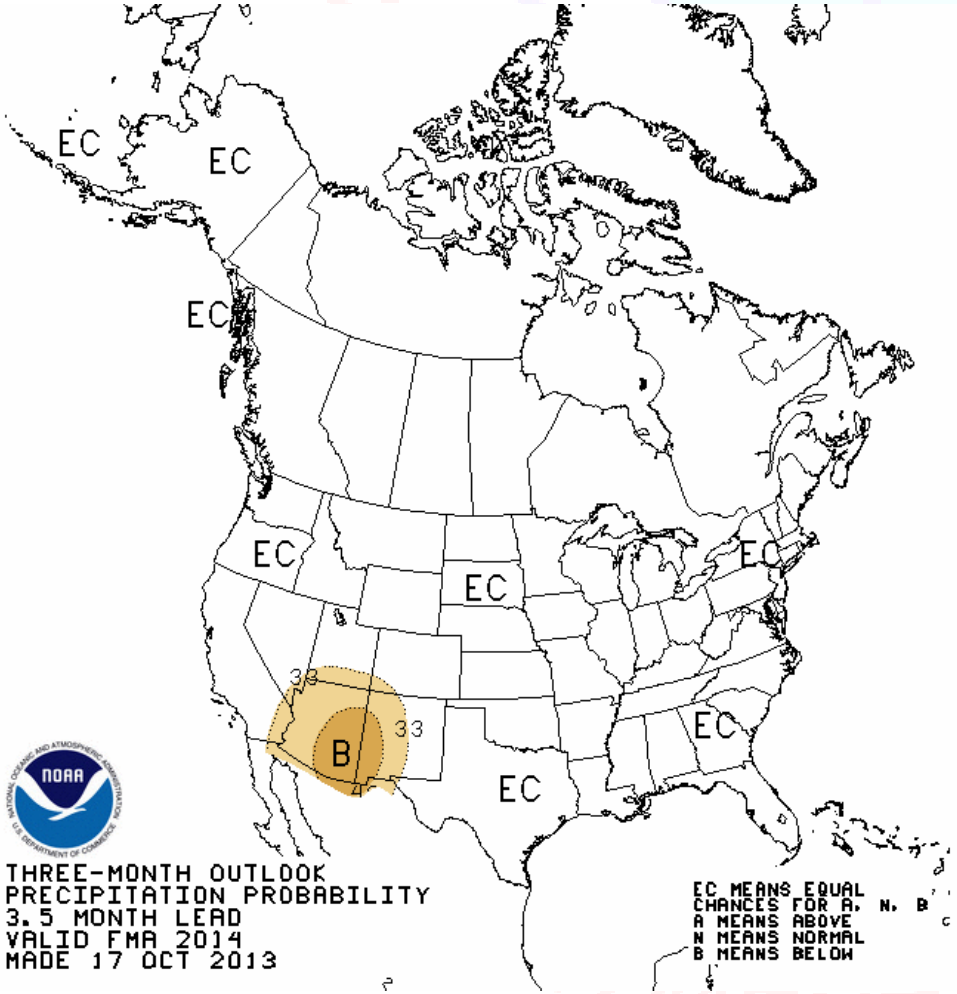


Slightly-enhanced likelihood of below normal precipitation for south Florida.

NOAA/CPC Precipitation Outlook
January - March

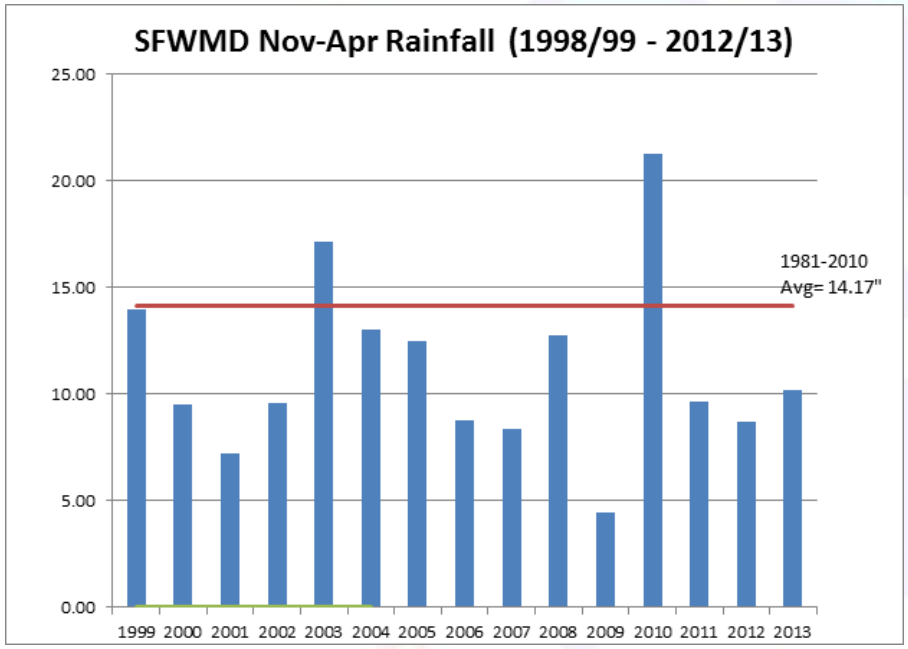


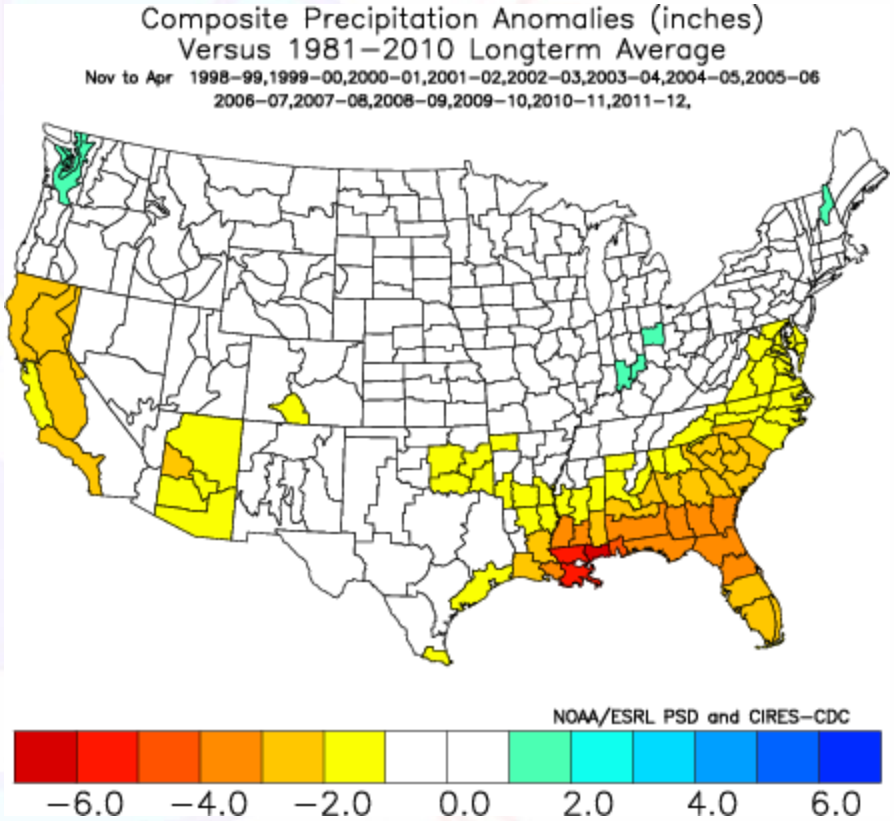
NOAA/CPC Precipitation Outlook
February - April



Equal chances of near/above/below normal, reflection of low Confidence.

Trends Since 1999: Drier Than Normal





Dry Season Outlook: Temperature

- **Near to slightly warmer** than normal temperatures.

- Much depends on non-ENSO factors and oscillations which can't be predicted well in advance. Therefore this forecast is **low to medium confidence**.

- One or two freeze events a possibility most winters. Greatest chance of freeze in Dec-Jan based on climatology.

- Long-term average winter temp: 64-66F interior/west to 67-69F east.

Dry Season Outlook: Precipitation

- **Drier than normal.** Supported by ENSO neutral and likelihood of negative PDO patterns.
- Pattern not reminiscent of driest winters, so the likelihood of an extremely dry “dry” season is low.
- Caveat: If jet stream/storm tracks stays farther north, stalled fronts across South Florida could be more common which can increase rain potential.
- Long-term dry season average: 12-19 inches.

Main Impacts

Lake Okeechobee: May 2008

Plentiful/green ground cover from wet summer and early fall adds fuel for wildfires. Dry spring following a previous wet summer/fall could increase threat, particularly from March to May.

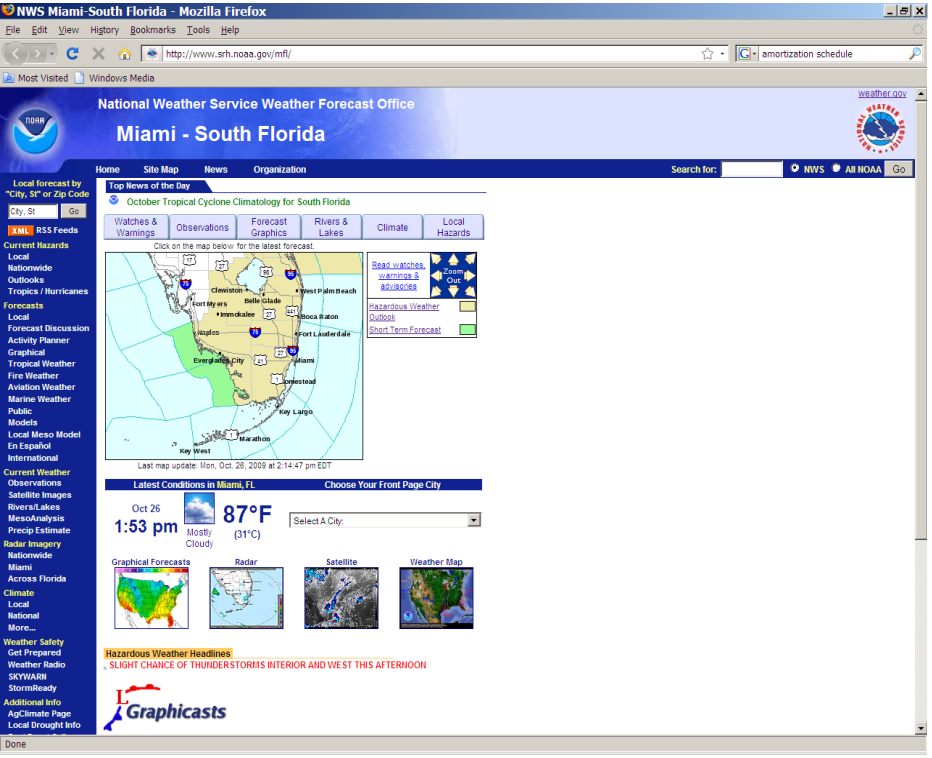
Summary

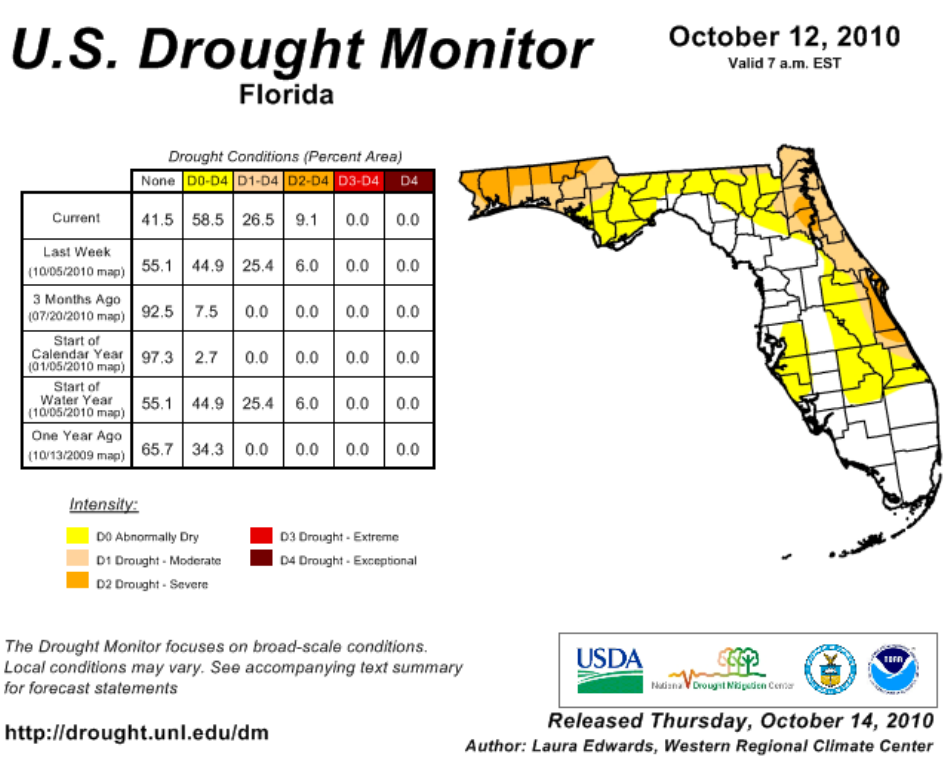
- Wetter than normal summer has south Florida in reasonably good water conditions and well placed for the dry season.
- **Near to slightly warmer** than normal temperatures.
- **Below normal precipitation.**
- This reflects an average, but remember that periods of extreme events can and do occur any season (cold, warm, dry, wet).

Summary (cont'd)

- **Main impacts could be a potentially-enhanced wildfire season.**
- **Freeze potential (if it occurs) most likely in December/January/February. Similar to climatology.**

Monitor local media and NWS web site





weather.gov/southflorida

During dry periods, U.S. Drought Monitor Provides Weekly Updates on drought status. Available from NWS Miami web page via the “Drought Information” link on the left hand side

Water Conditions Summary

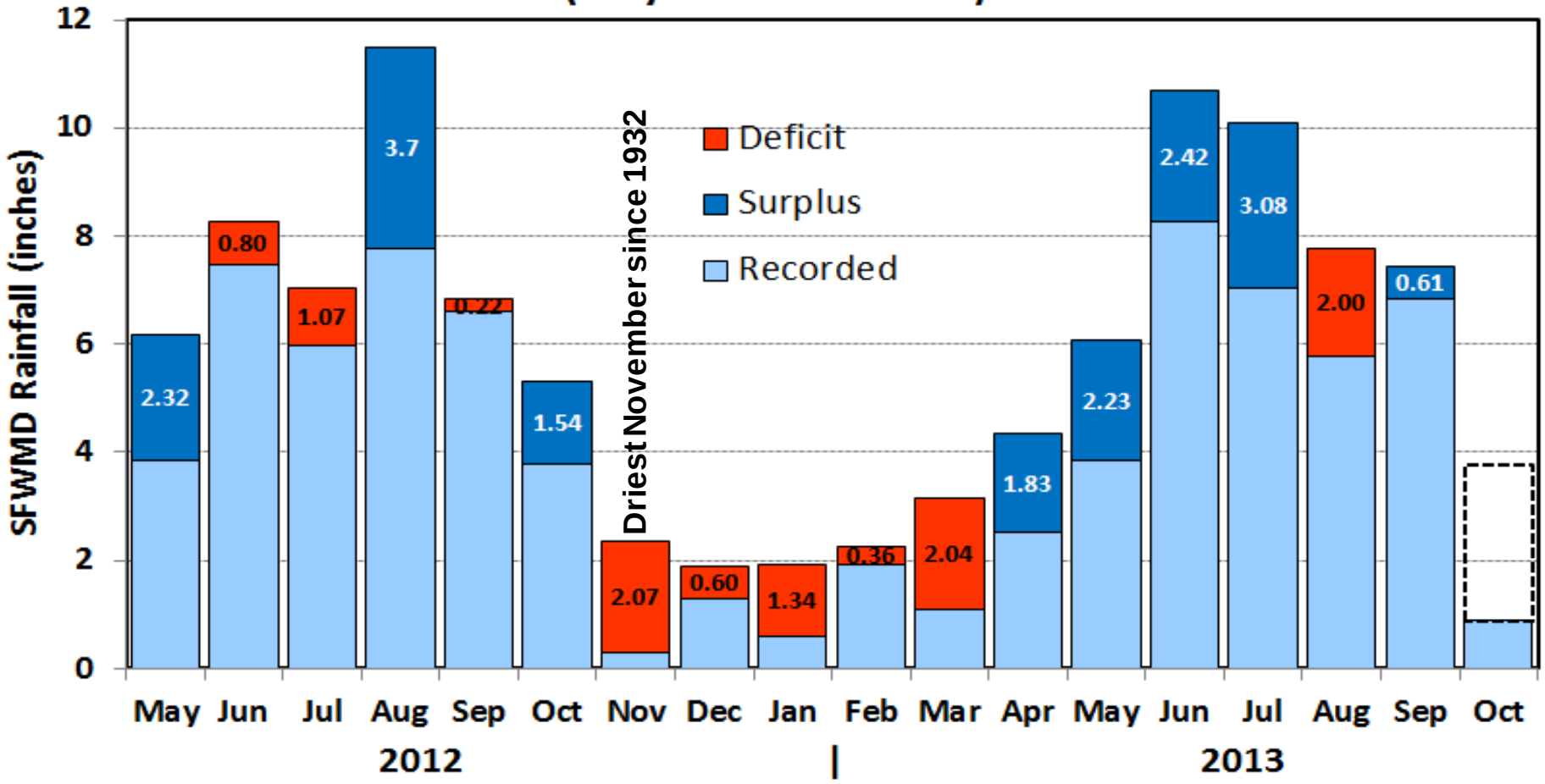
2013 / 2014 Dry Season Outlook

October 18, 2013

Susan Sylvester, Chief
Water Control Operations Bureau

SFWMD Rainfall Distribution Comparison

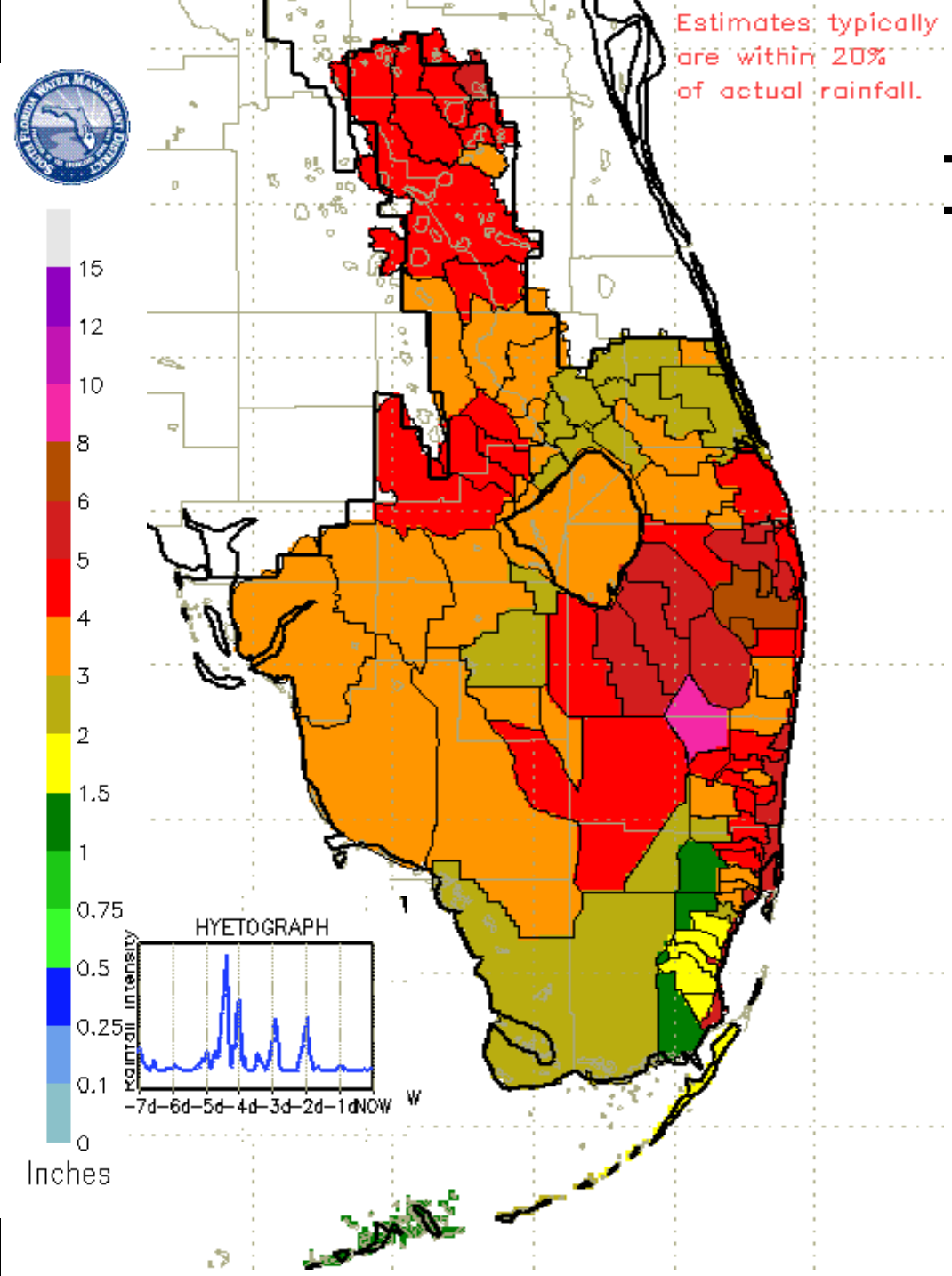
(May 2012 - Oct 2013)



2012 WET SEASON:
- Started early with wet May, followed by dry June and July . TS Isaac brought August rainfall high above average.
- Ended up above average.

2012-13 DRY SEASON:
- Driest November since 1932
- Below average despite April/May being above

2013 WET SEASON:
- May 18th Start
- T.S. Andrea produced 3.1 inches District wide



SFWMD

Tropical Storm Andrea

(June 6 - 8, 2013)

DISTRICT-WIDE: 3.1”

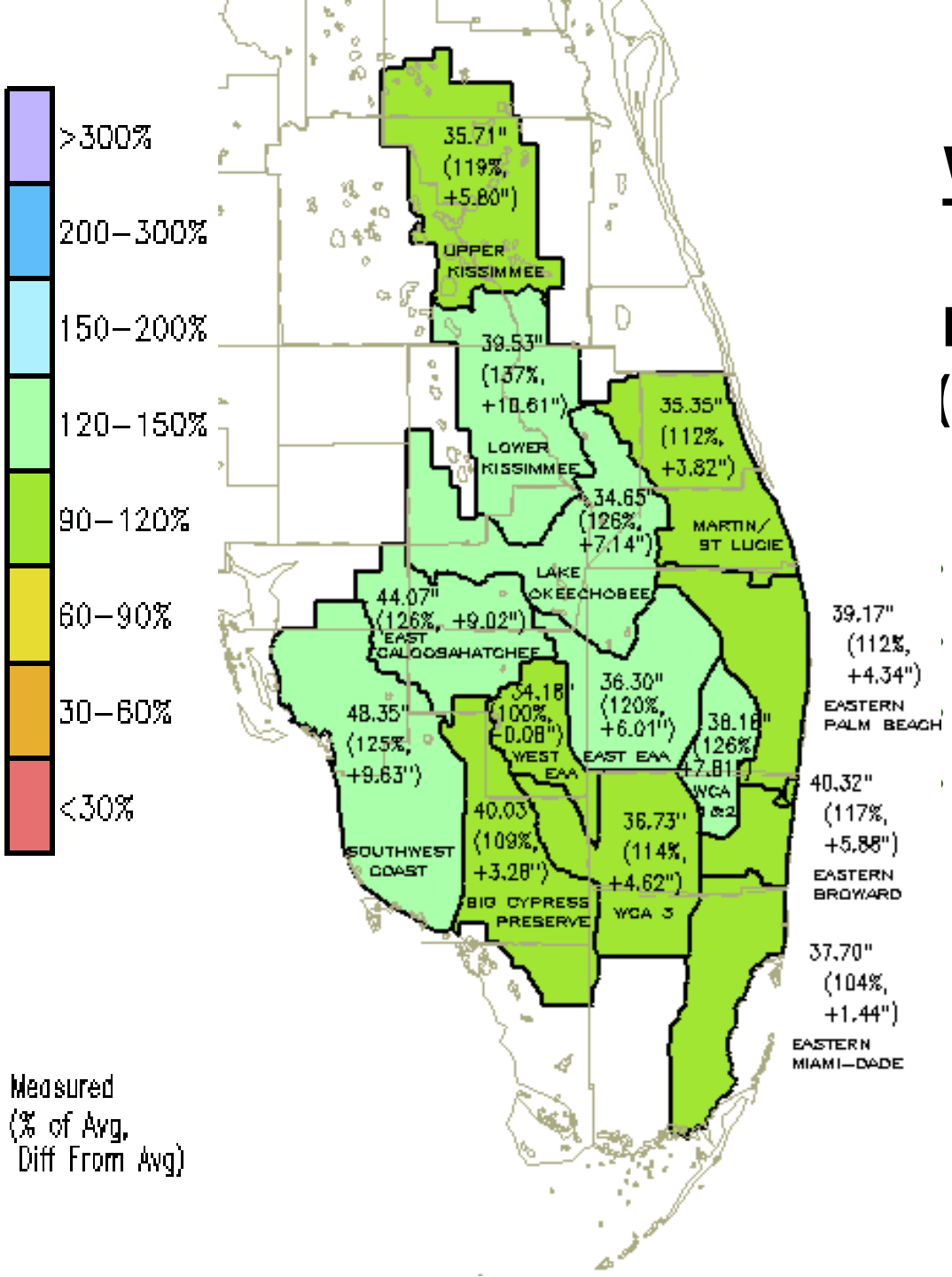
- TS Andrea produced about 3.1” District wide
- Which is about what the District receives in an average year due to tropical activity
- Several basin wide averages were 4 to 8 inches
- Many of these same areas were already saturated from earlier rainfall

SFWMD

Wet Season Rainfall

May 18 2013 – Oct 8 2013

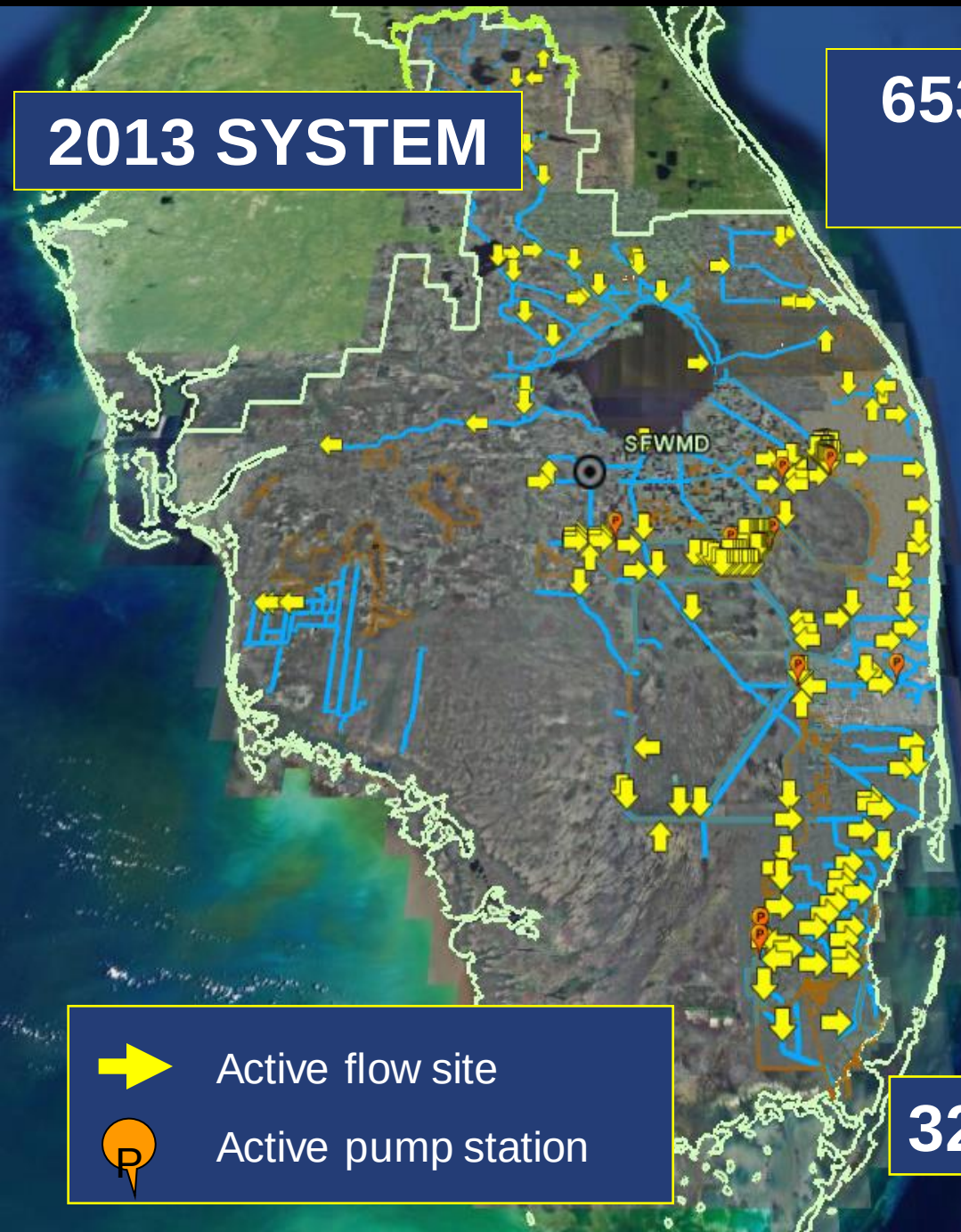
DISTRICT-WIDE: 38.03” (120% of Avg, or +6.42”)



- Wet Season Started ~ May 18th
- All basins > 100% average
- April-July was very wet
- April-September period with 45.22” was the wettest since 1960 (53-yr period)

2013 SYSTEM

653 Major Water Control Structures

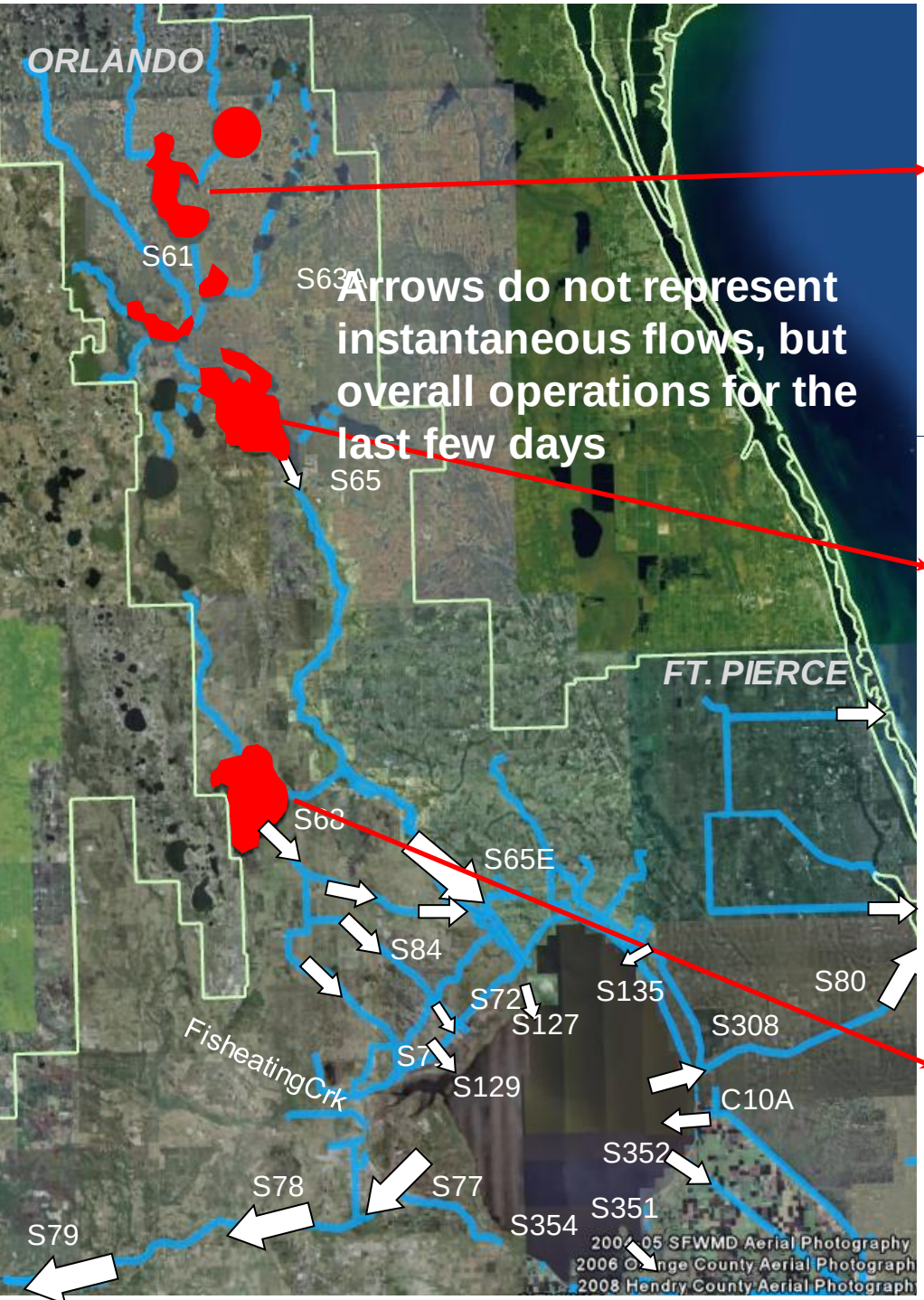


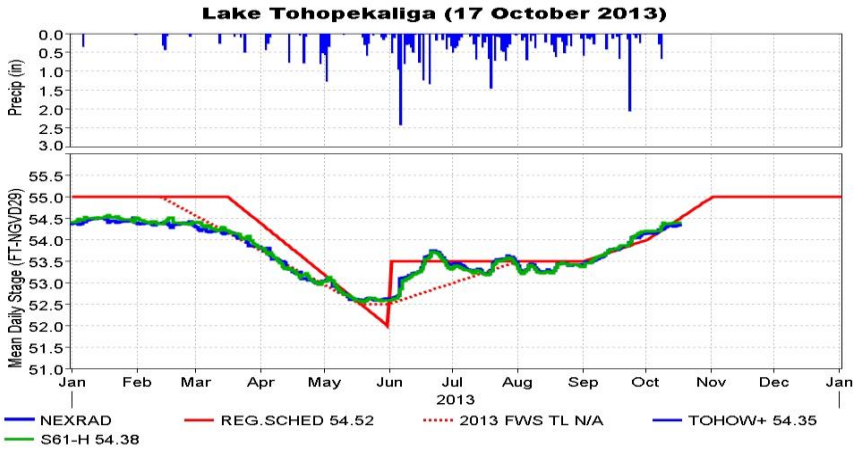
- 411 Gated Culverts
- 110 Gated Spillways
- 66 Pump Stations
- 17 Locks
- 49 Weirs
- 2,669 miles of Canals
- Berms and Levees

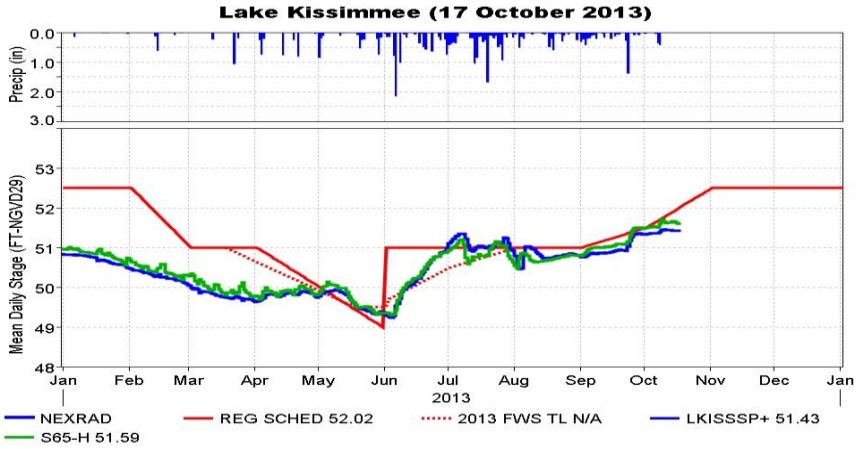
Active flow site

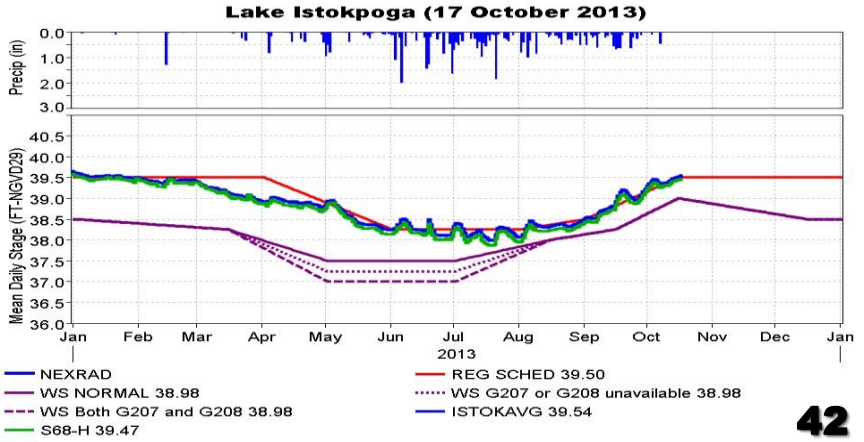
Active pump station

322 of these are in STAs

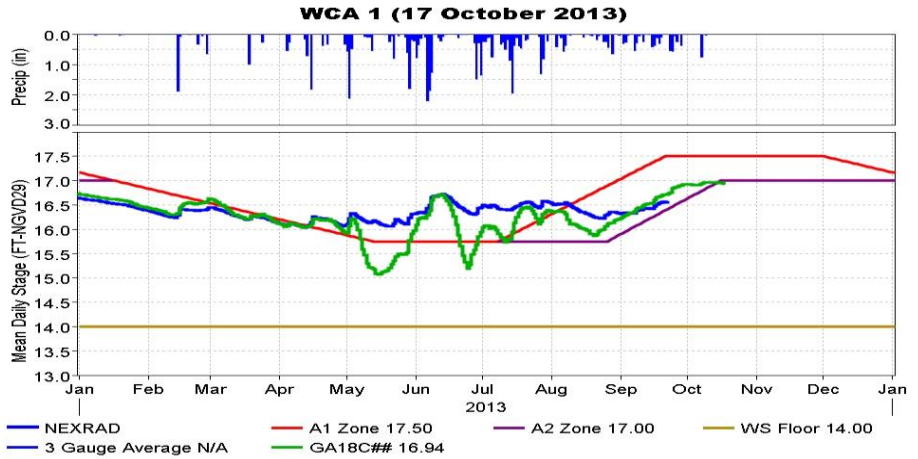

ORLANDO
S61
S63A
Arrows do not represent instantaneous flows, but overall operations for the last few days
S65
FT. PIERCE
S65E
S84
S72
S127
S135
S80
S308
FisheatingCrk
S129
C10A
S352
S78
S77
S351
S354
S79
2004-05 SFWMD Aerial Photography
2006 Orange County Aerial Photograph
2008 Hendry County Aerial Photograph

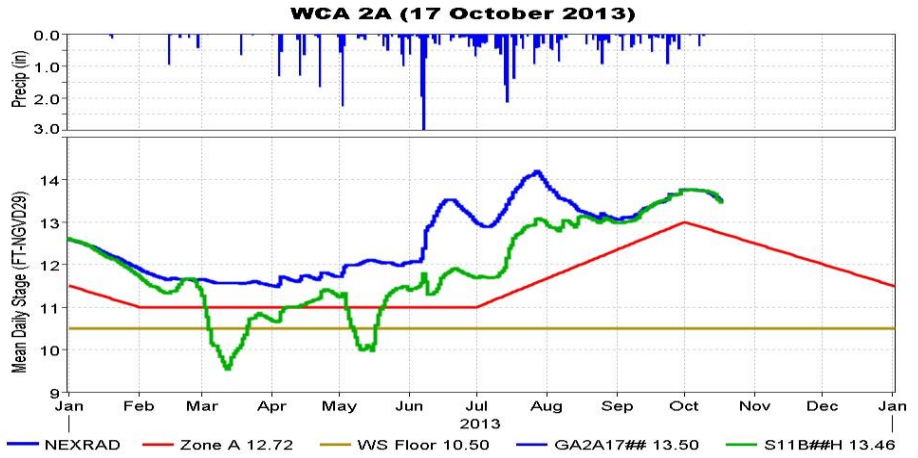

Lake Tohopekaliga (17 October 2013)
Precip (in)
Mean Daily Stage (FT-NGVD29)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan
2013
NEXRAD
REG.SCHED 54.52
2013 FWS TL N/A
TOHOW+ 54.35
S61-H 54.38

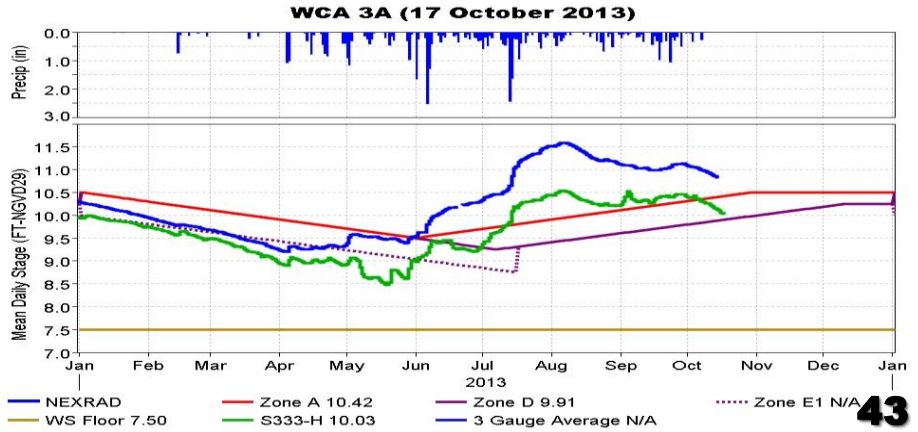

Lake Kissimmee (17 October 2013)
Precip (in)
Mean Daily Stage (FT-NGVD29)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan
2013
NEXRAD
REG SCHED 52.02
2013 FWS TL N/A
LKISSSP+ 51.43
S65-H 51.59


Lake Istokpoga (17 October 2013)
Precip (in)
Mean Daily Stage (FT-NGVD29)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan
2013
NEXRAD
REG SCHED 39.50
WS NORMAL 38.98
WS G207 or G208 unavailable 38.98
WS Both G207 and G208 38.98
ISTOKAVG 39.54
S68-H 39.47


Arrows do not represent instantaneous flows, but overall operations for the last few days
S5AE
S5A
WCA-1 (LNWR)
S6
G94C
G372
G370
S-10D
S-10C
S-10A
S7
S8
WCA-2A
S39
S-11C
S-339
S-11B
S-11A
S38
s14
0
S-340
WCA-3A
S9
S13AW
S13
S-151
S31
S-337
S-344
S-343A
S-343B
S-12A
S-12B
S-12C
S-12D
S-333
S-334
S-335
ENP
S-331
Arrows are not to scale

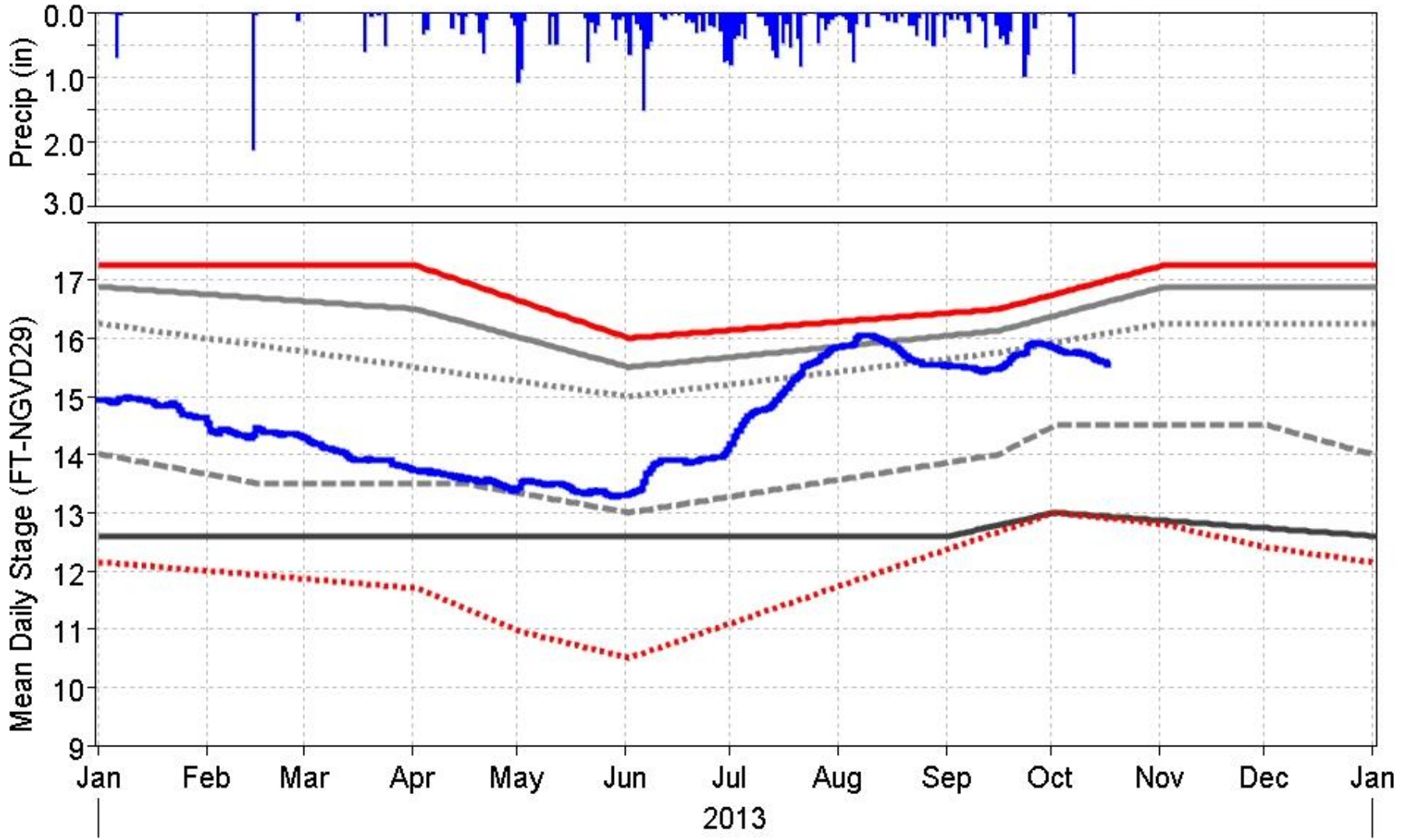

WCA 1 (17 October 2013)
Precip (in)
Mean Daily Stage (FT-NGVD29)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan
2013
NEXRAD
A1 Zone 17.50
A2 Zone 17.00
WS Floor 14.00
3 Gauge Average N/A
GA18C## 16.94


WCA 2A (17 October 2013)
Precip (in)
Mean Daily Stage (FT-NGVD29)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan
2013
NEXRAD
Zone A 12.72
WS Floor 10.50
GA2A17## 13.50
S11B##H 13.46

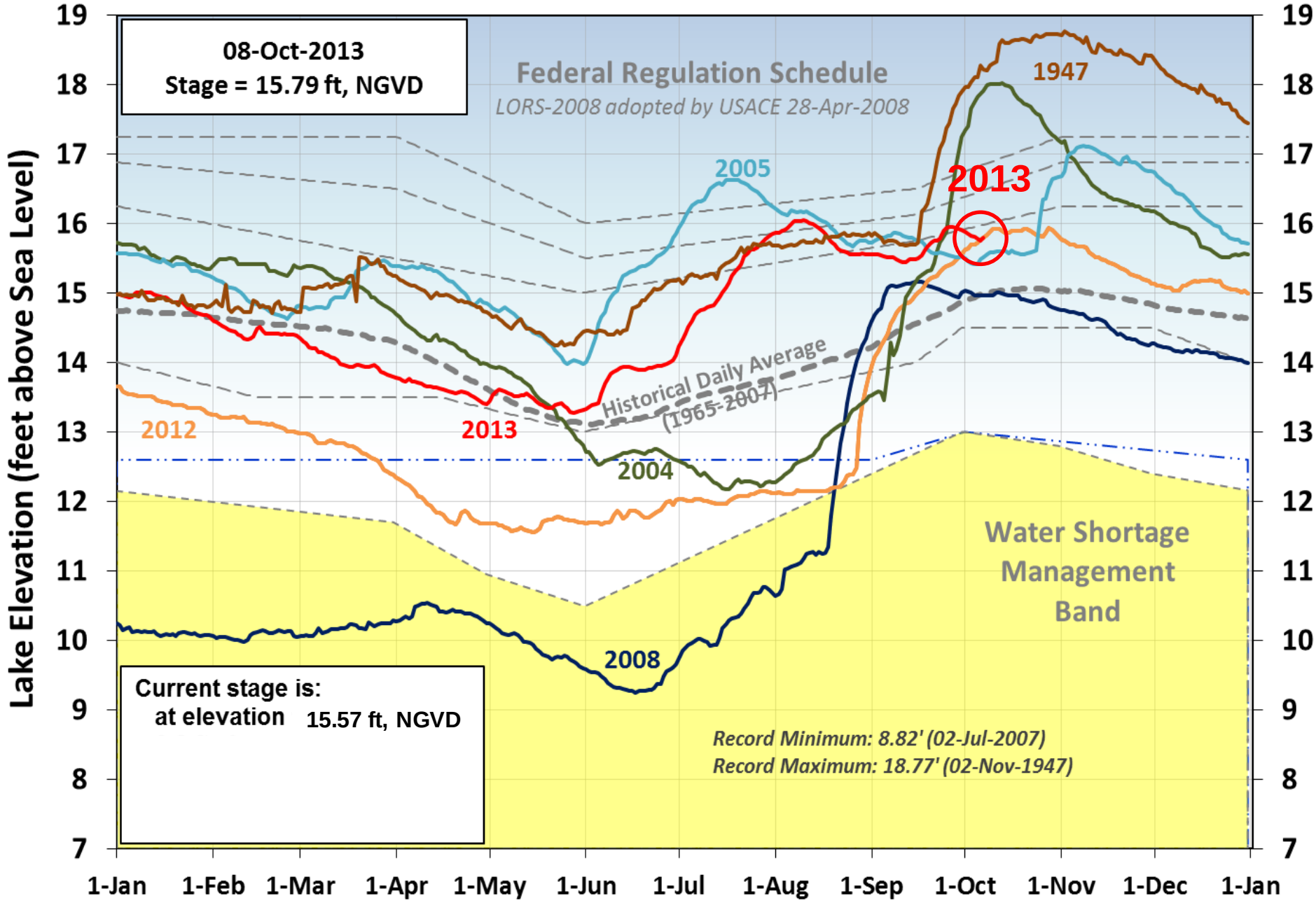

WCA 3A (17 October 2013)
Precip (in)
Mean Daily Stage (FT-NGVD29)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan
2013
NEXRAD
Zone A 10.42
Zone D 9.91
Zone E1 N/A
WS Floor 7.50
S333-H 10.03
3 Gauge Average N/A

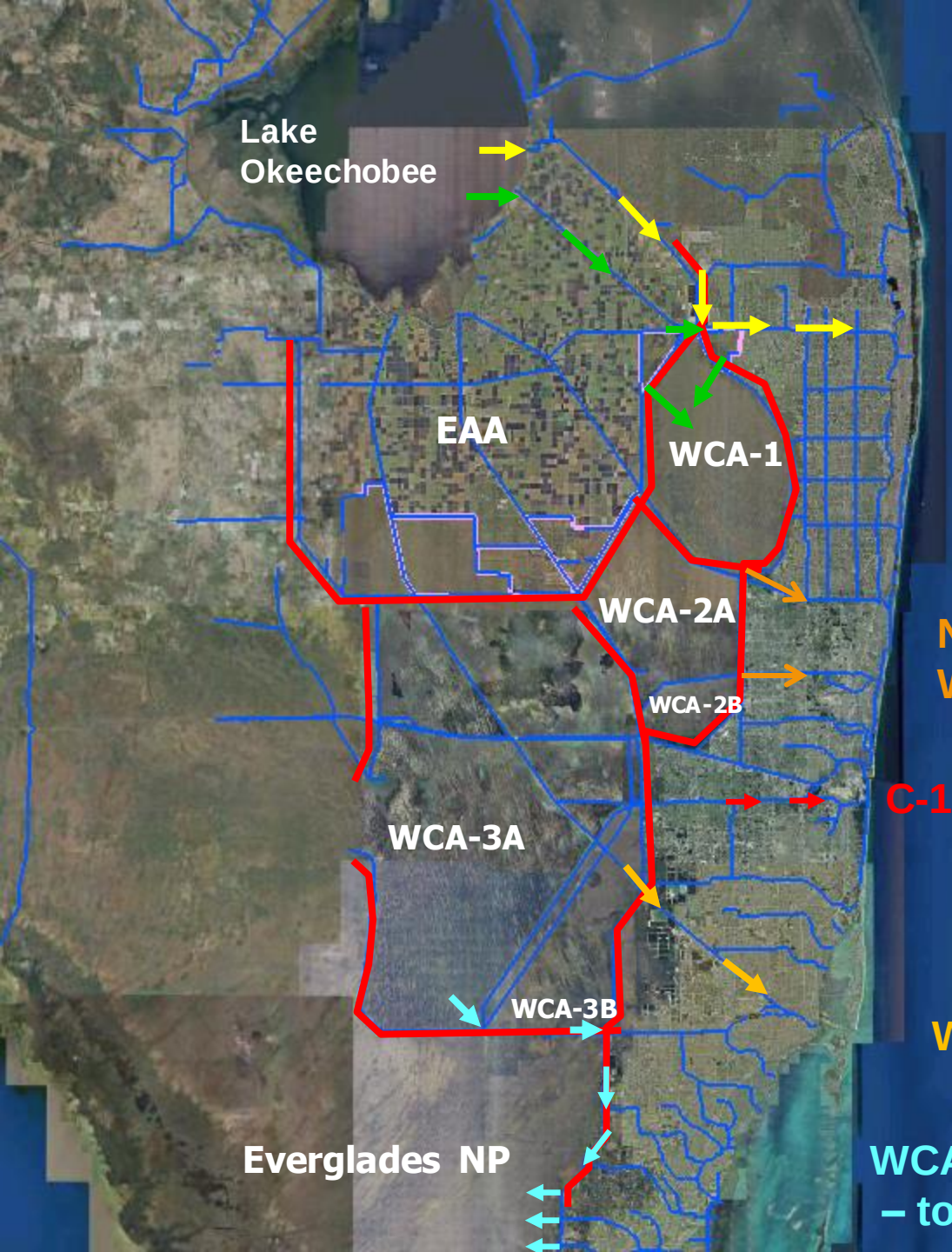
Lake Okeechobee Operations

Lake Okeechobee (17 October 2013)



Lake Okeechobee Water Level Comparison





Special Operations

Aug – Sep 2013

Lake Okeechobee – L-8 – C-51 to tide

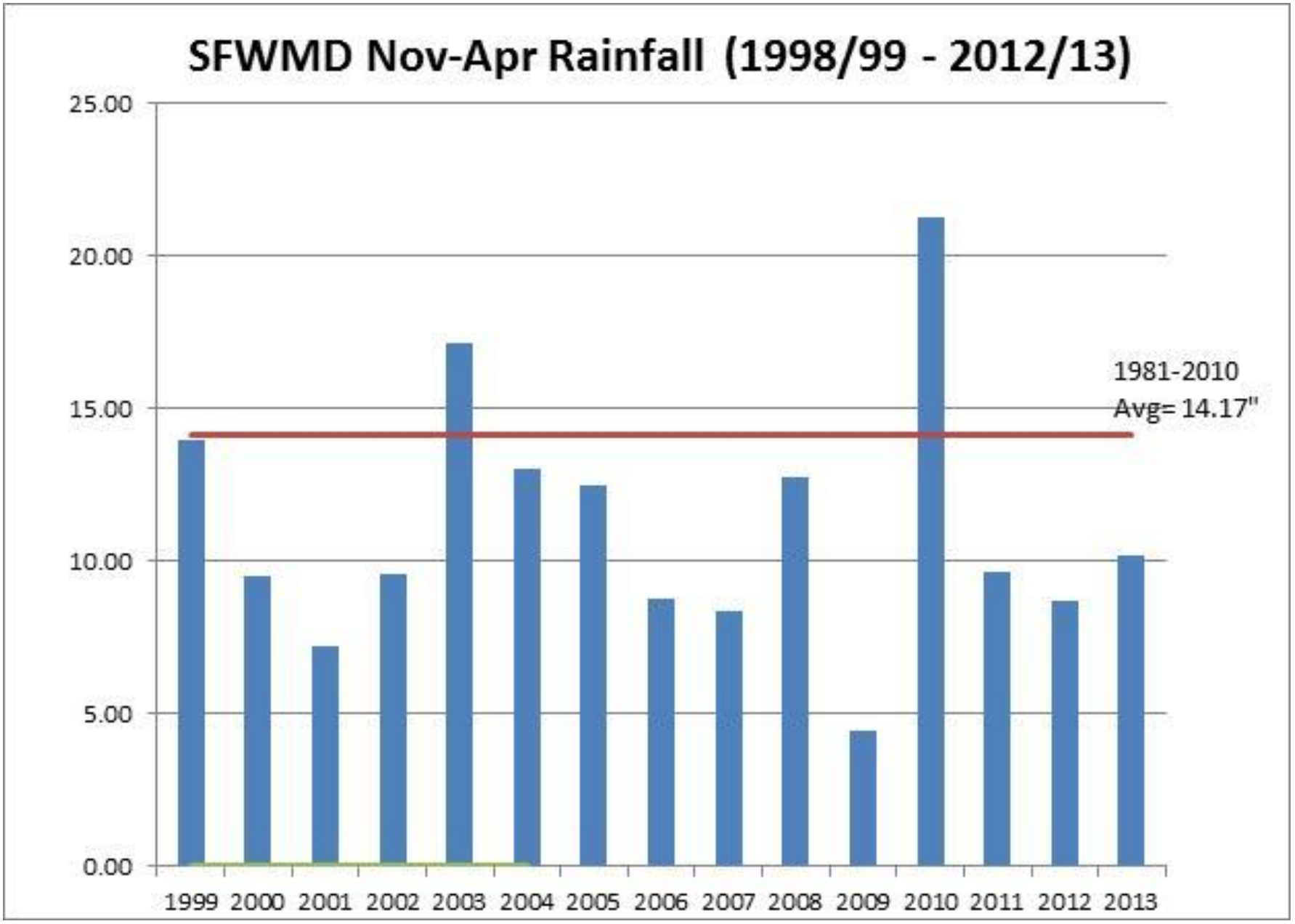
Lake Okeechobee – WPB Canal to STA1 (Pump) - WCA-1 (Pump)

Normal Regional Operations – WCA-1 & 2 to tide

C-11 West – S13A – S13 (Pump) – to tide

WCA-3 – C-6 – S-26 (Pump) – to tide

WCA3 – Tamiami Canal – SDCS (Pump) – to ENP


SFWMD Nov-Apr Rainfall (1998/99 - 2012/13)
25.00
20.00
15.00
10.00
5.00
0.00
1981-2010
Avg= 14.17"
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013

Summary:

- Some areas of South Florida receive a years worth of rain during the past six months.
- NOAA Climate Prediction Center forecast calls for **higher chances of below** average rainfall through the January – March period.
- Only two South Florida Dry seasons, 2003-2004 and 2009-2010, have actually been above average in the past 15 years.
- SFWMD will manage water levels in an effort achieve an optimum recession rate through the dry season to balance the needs of the natural system and regional water supply.